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MODERN DEVELOPMENTS IN COAL CARBONIZATION

DEVELOPMENTS in the Glover-West system of carbonization in continuous vertical retorts described by Mr. C. A. Poulson, at a joint meeting of the Scottish Junior Gas Associations last month, are no doubt paralleled by developments in other systems. They are evidence that constructional engineers did not allow their occupation with armament production during the past six or seven years to prevent them from thinking about the problems with which the Gas Industry would be faced after the war. The major problem was to be that of manpower. Men would not be content to go on with the arduous labour under unpleasant conditions which they had hitherto so willingly performed. Machinery must replace sweat. And there will be no more difficulty in the Gas Industry than in any other industry in finding men to operate technical equipment, provided, of course, that the Industry goes the right way about the recruiting and training of the type of man suited to the new duties.

Nor has sight been lost of efficiency. Designers have not been content with the recovery of heat rejected at the exit of the retort settings. They have striven, and striven successfully, to reduce the surplus (or "waste") at this point. Steam raised by the recovery of waste heat was useful, its recovery was meritorious, but it is no satisfactory substitute for a definite reduction in the total amount of fuel used in the carbonizing process. The "balanced" system of heating described by Mr. Poulson was developed and tried out before the war. It makes a definite reduction in the fuel account. The design is good and the economy effected is due to two main facts. In the first place the retort walls are in contact with fuel gases at the point of combustion where, as is well known, the evolution of heat energy is at its maximum. In the second place combustion takes place towards the interior of the setting, losses by radiation and convection being trapped and retained in the outer walls. A third advantage claimed for this design—and this, we believe, was the main reason for its inception—is that it secures a symmetrical arrangement of the masses of brickwork in the retort bench. The inevitable expansion of refractories thus arranged must give rise to less risk of deformation than where there is a marked difference in the distribution of mass between one side of the setting and the other.

The mechanical producer has not met with much success in the retort houses of this country, chiefly, perhaps, because we attempted to follow too closely the practice on the continent. The separate producer—worked at high pressure in order to get a high capacity per unit and necessitating cooling of the gas for transmission and reheating for ignition—was thermally inefficient. Maintenance was costly. In the design shown by Mr. Poulson we have our own native integral producer, fitted with mechanical clinkering, operating at low pressures, and with just sufficient gas-cleaning to enable it still to deliver hot gas direct to the settings. The claims for its thermal efficiency are set high. We see no reason why they should not be realized in extended practice. We look forward to some interesting results in a few years' time from the large installation in which they are now being built. If they do no more than cut out the heavy and often unsatisfactory labour of manual clinkering, they will mark a notable step forward in retort house practice.

The new coke extractor is not, maybe, so radical a departure from the type which it is to displace as might appear at first sight. The "worm extractor" made its movement at two or three minute intervals. This one lowers the charge every forty minutes. The result must have been to some extent unexpected. It is well known, of course, that coke made with the charge at rest is denser and stronger than that with the charge on the move, or at any rate at short intervals. Forty minutes rest appears to be sufficient to make a distinct advance towards the greater strength of the "static" coke. The disappearance of the necessity for rodding must be as welcome as it was unexpected. The explanation is interesting. "When the charge is in continuous descent" the deposit of pitchy matter in the neck of the retort "tends to grow until rodding is necessary to dislodge it. But if the deposit is kept stationary for a short time it hardens into the initial stages of coke formation and its adhesion to the retort wall diminishes. If now the charge is dropped through a substantial distance it will slide over the retort surface leaving the surface clean." At any rate, the abolition of rodding will get rid of another of the hot, heavy jobs in the retort house that can well be dispensed with.

But perhaps the development most likely to have far-reaching consequences is the application of the water-flow conveyor to the continuous vertical. We have here retorts standing in a water-seal into which the coke will drop direct without the intervention of airtight doors and from which it will be swept away, somewhat in the manner of the flume (Le Fleuve) conveyor of the horizontal retort house. There should be no more risk of overloading the coke with water in the one case than in the other. "The new system cuts out another of the manual operations in the retort house," and it would appear to be a solution of the dust problem.

Mr. Poulson touched on a number of other points of retort house design which engineers have had in mind for a long time. A comparatively small amount of additional money spent on giving the retort house at least a respectable appearance is now generally agreed to be wisely spent. There is no reason at all why gas-works should present an assortment of rusty ironwork to the outside world. More prac-

tically important is the provision of effective ventilation in the retort house. This can be done well by careful design of the roof.

Mr. Poulson, we suggest, is justified in claiming that the several developments he has described are a decided step forward to the realization of the retort house, if not perhaps to "press button control," at least to a modern technical process in which machinery will replace muscle and brain will be of more value than brawn. An extract of the Paper is published in our pages to-day; the Paper will be given in full in the February issue of "GAS."

LIFE STORY OF A CONTINUOUS VERTICAL

GREAT encouragement is to be derived from item 7 of the 37th Report of the Refractory Materials Joint Committee, which Report was presented at the Research Meeting of the Institution of Gas Engineers. The research man is to go out "into the field." Not that there is anything new in this to our friend Mr. A. T. Green. He began there. He often goes back there. "During" much more than "the past two years" he has made "inspections of the brickwork of the retort chambers of a number of continuous vertical retort installations—as opportunity offered, when they were let down for dismantling or repair," and, let it be added, when the refractories had failed for some unknown reason which he endeavoured to discover. He is just going to see that his staff make a habit of it. He will, therefore, not dispute anything which is likely to be said here, except perhaps about the proposed questionnnaire. We are not particularly fond of questionnaires. There are so many different ways in which the same question may be answered. And unless the same question is answered by the same observer it is so very difficult to apply the "personal equation."

We suggest an alternative, or, if you like, a parallel, method. Let there be selected a number of installations now being built and which are to be operated by competent men, and let a complete log of each retort be kept over a period of years—perhaps as many as ten—and let the log be supplemented by periodical visits of inspection, also completely logged, by one or more members of the research staff. Then we should have an accumulation of highly useful data.

The life story of a retort begins at the heap of raw materials at the refractory brickworks. It is comparatively easy to keep chemical and physical control of that phase. But it is not so easy to control the properties of the goods as they come from the kiln and again as they are built into the setting. Manufacturers and builders do what they can. The best of them take samples, necessarily at random but selected with intelligence, break them down for analysis and test, and file the records against the days of trial. The operator, when the needful apparatus is at his disposal, should be encouraged to do the same. Even when he has not got the apparatus he could collaborate with the builder in the choice of samples and these can be impartially examined at the Mellor Laboratories. The operator will know that he begins with materials which comply with the Standard Specifications. That is the first entry in his log.

The Report lists four zones with some of the mishaps which may occur. Zone 1 is the fireclay top. The retort wall temperature measurements at Stoke, reported in the previous section, have shown in actual figures what must have been known in general by every operator, the sudden changes and over what range which is suffered by this part of the retort. It is also liable to injury by rodding tools, emphasizing the need for care in this operation and emphasizing too the desirability of designing top fittings so that rodding can be carried out without injuring the retort wall. There is also need of care in scurfing. One has seen retort tops at much too high a temperature when this is being done. The log should record full details of every scurfing. Here we may remark that if the constructor's instructions are followed, temperatures can be readily controlled and there should be no "hot tops."

Zone 2 is not only that in which scurf is formed; it is often the hottest zone where overheating may occur. A hanging charge may occasion a rise of temperature, suddenly lowered when the charge is dropped. This should be logged. Careful inspection at every scurfing, with observations of temperatures and other conditions fully recorded, will always provide useful data. Zone 3 is usually below the scurf line and here not only slagging but small cracks most often occur. These should be dealt with promptly. Our columns during 1946 have shown how this problem can be attacked.

Whenever a retort is let down it should be entered, visually examined, and measured to ascertain whether any wear or deformation is taking place. And when it is reset the old material should be examined brick by brick, if possible in collaboration with a member of the research staff. Many interesting, and some astonishing, data will thus be accumulated. We do not think that even if this procedure is faithfully carried out the causes of all the failures will be revealed, but at any rate the margin of mystery ought to be considerably narrowed, in which event the Director of Refractories Research and his staff will have done an incalculable service to the art and science of carbonizing.

The Compulsory Cut

The compulsory cut in industrial consumption of gas and electricity announced by the Minister of Fuel and Power and referred to in the "JOURNAL" of Dec. 11 (p. 1037) is enforced under the Electricity and Gas (Reduction of Consumption) Order, 1946, dated Dec. 10, 1946, made by the Minister of Fuel and Power under Regulations 55 and 55aa of the Defence (General) Regulations, 1939, as having effect by virtue of the Supplies and Services (Transitional Powers) Act, 1945 (S.R. and O. 2087, 1946). The Order, which came into force on Dec. 21, requires a reduction of the consumption of gas and electricity consumed in those industrial undertakings, hotels (including railway hotels), clubs, restaurants, and places of entertainment and sport in which the normal yearly consumption of fuel exceeds 100 tons of coal or 130,000 units of electricity, or 1,400,000 cu.ft. of gas. The consumption of gas and electricity must be reduced over each of the four-week periods beginning on Dec. 30, Jan. 27, and Feb. 24, by 2½% of the consumption during a specified basic period. The Order defines the basis as "four times the average weekly consumption based on the last meter reading before Dec. 21." Provision is made for the consumption of larger quantities of gas and electricity where authorized by licence.

GAS SERVICE POCKET BOOK, 1947

Temporarily suspended during the war years, publication of the popular Gas Salesman's Pocket Book is now being resumed, under the new title of the Gas Service Pocket Book. The 1947 edition, which will be on sale in a few weeks, has been completely revised, and a new section has been added detailing the several Codes of Practice issued during the war, covering separately the requirements for each type of gas service—cooking, water heating, refrigeration, &c. Standard information deals with pipes and meters; governors, heating; cooking; water heating, laundry; refrigeration; and industrial uses; it also covers the use of coke and gives information on the fixing of domestic coke appliances. The Pocket Book costs 3s. 6d., post free, from Walter King, Ltd., "Gas Journal" Offices, 11, Bolt Court, Fleet Street, London, E.C.4.

Personal

Retirement of Mr. A. E. Sylvester

The retirement from the Governorship of the Gas Light and Coke Company of Mr. A. E. Sylvester after a term of office of only eighteen months—as briefly reported in the the "JOURNAL" of Dec. 25—is due to ill-health brought about by wounds received in the 1918 war. Mr. Sylvester's first association with the Company began in 1932, when, at the request of the Court of Directors, he came as a consultant to advise on certain aspects of reorganization. He was at that time a partner in a leading firm of Chartered Accountants in the City of London, with whom he had gained much valuable experience both at home and abroad.

His particular *forte* was his knowledge of finance and his flair for organization, which prompted the Directors to offer him in 1934 the position of Comptroller of the Company, which he accepted, thereafter assuming responsibility for the whole of the financial and commercial conduct of the concern. He at once set in motion a train of reorganization which entirely reorientated the Company's policy, bringing it into line with current requirements.

The area of supply of the Gas Light and Coke Company, once confined to Metropolitan London, had grown by a series of amalgamations in the twenties and early thirties until it reached from Southend to Windsor: yet, when Mr. Sylvester took charge of the commercial affairs of the Company, it was still administered on a centralized system from Westminster. This proved to be increasingly inflexible at a time when great sensitiveness was required in order to meet electrical competition, and he decided that an entire revision of method was necessary by which, in place of the centralized departments each dealing with its own limited range of activities, a decentralized organization was substituted. In this, Managers, acting only on a general line of policy laid down at Chief Office, were made responsible for all activities in a defined area.

Perhaps the most notable of Mr. Sylvester's many achievements was that he was able little by little to revise and adapt the old system of the Company so that the new decentralized Divisional Organization came into being it might be said almost imperceptibly, without any dislocation of the Company's business. Several departments and a large part of the Company's employees, were involved, yet such was his eye for detail and his humanity that no change was made without due regard being taken for the interests of the employees concerned.

On the accounting side Mr. Sylvester had made many changes, one of the most important of which was his insistence upon the elimination of the fluctuations in the available net revenue from year to year occasioned by predictable irregular expenditure on works (for example, on resetting). This he achieved by equalization funds, into which a predetermined contribution was made each year from revenue in order to meet the expenditure when it occurred. He furthermore carried out under his own personal supervision a great deal of research into supply costs and methods of charge, being insistent always upon a proper provision for depreciation of assets and pointing out the importance of taking full account of the load factor of the business.

After his appointment to the Governorship of the Company, Mr. Sylvester took up the task of reorganizing the higher management, evolving a system by which the whole conduct of the concern (apart from production of gas) was placed in the hands of Controllers, each dealing with his own section of the business, and each responsible to, and in daily contact with, the Managing Directors. The method of working of the Court of Directors itself has also been revised, Committees consisting of Directors and chief officers having been set up to deal expeditiously with different aspects of the Company's business.

As a result of 14 years of reorganization covering the whole range of the Company's activities, Mr. Sylvester retires from active participation in the conduct of the Gas Light and Coke Company, leaving it financially stronger and functionally more sound than it has been for many years, every detail of its present organization being a monument to his care and skill.

Mr. MICHAEL MILNE-WATSON, who, as reported last week, has been appointed Governor of the Gas Light and Coke Company, is the youngest Governor the Company has had since its inception 134 years ago. He was educated at Eton and Balliol, and spent a short period in the office of a well-known firm of chartered accountants in the City. He entered the Gas Light and Coke Company's service in 1933 and was appointed an Assistant to the General Manager in 1935. Two years later he was made Assistant to the Controller of Gas Sales, and in 1940 became Manager of the London Gas Centre. The latter included the organization and control of the gas supply to the whole of Greater London, and while Manager of the Centre he was appointed in turn Assistant Comptroller, then Assistant General Manager, and later Commercial Manager (1942). In 1943 he volunteered and was accepted for service in the Royal Navy, from which he was released in October, 1945, when he was appointed Joint Managing Director. He assumes the Governorship of the Company from to-day (Jan. 1).

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Mr. J. B. CLAY, who has represented Alder & Mackay, Ltd., for some 20 years in the North of England, has been appointed Sales Manager of the Company.

Mr. R. J. BAINES, who was until recently a member of the London staff of Newton, Chambers & Co., Ltd., has joined the London staff of Henry Balfour & Co., Ltd., as a Technical Representative.

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Mr. C. S. W. HARRIS has been appointed Assistant Manager and Secretary of the Imperial Continental Gas Association, and Mr. W. N. DEVONSHIRE, O.B.E., has been appointed Assistant Secretary.

* * *

The Directors of the Newcastle-upon-Tyne & Gateshead Gas Company announce that they have appointed Mr. JOHN D. COWEN, M.C., as Chairman of the Company as from Jan. 1 in place of Sir CECIL A. COCHRANE, who has retired.

* * *

Mr. J. G. TILLEY, Engineer and Manager of the Brighouse Gas Department, has been appointed Engineer and Assistant Manager of the East Hull Gas Company in succession to Mr. J. R. MARTINDALE, who goes to the Sheffield and District Gas Company as Engineer in charge of the Neepsend works.

* * *

Mr. A. BRADBURY, who has been in charge of the Chemical Sales Department of the Staveley Coal & Iron Co., Ltd., Chesterfield, since its formation, has been appointed to a new post that has been created, namely, that of Assistant Commercial Manager, and Mr. ARTHUR SLATER has been appointed Manager of the Chemicals Sales Department.

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Mr. J. F. THOMAS, Manager of the Cardiff branch of Falk, Stadelmann & Co., Ltd., retired from that post on Dec. 31. Mr. Thomas entered the service of the Company on Mar. 3, 1903. From 1906 to 1927 he was Outdoor Representative in South Wales, and has been Manager at the Cardiff branch from the time of its opening on July 1, 1927. He will continue to act in an advisory capacity and will be succeeded as Manager by Mr. A. W. GIBBS, who has been the Assistant Manager at Cardiff for many years.

* * *

Chief officials of the Sheffield and District Gas Company held their 15th Annual Dinner on Dec. 23, and for the first time ladies were invited. The occasion marked the retirement, after 27 years' service, of Mr. S. T. S. MUSGROVE, Distribution Superintendent, and both he and his wife were recipients of gifts from the Chief Officials. The chair was taken by Mr. Ralph Halkett, General Manager and Chief Engineer. The presentation of a gold wristlet watch to Mr. Musgrove and a leather handbag to his wife was made by Mr. Ralph Halkett, a Director of the Company, who in paying tribute to Mr. Musgrove's loyal service wished him "Good health, long life and the good wishes of all his colleagues" in his days of retirement. Before going to Sheffield, Mr. Musgrove was with the Bournemouth Gas and Water Company. During the years that he has been with the Sheffield and District Gas Company he has seen great developments in its activities, for in 1919 the Company's area of supply was but 137 square miles, to-day it is 328 square miles. The length of mains has been extended from 639 to 1,400 miles; while in 1919 there were no slot meters, to-day there are approximately 90,000. Many local Gas Companies have been taken over during Mr. Musgrove's period of service including Woodhouse, Dronfield, Elsecar, Baslow, Matlock, Bakewell, Barnsley, Eckington, Killamarsh and Worsboro.

* * *

Notification of the retirement of Mr. JAMES JAMIESON, Engineer and Manager of the Edinburgh Gas Department, was made at a meeting of the Public Utilities Committee on Dec. 20. Mr. Jamieson has had a lifelong connexion with the Gas Industry and is a member of a family of gas engineers, his father and grandfather having been associated with the Industry. He was appointed Assistant Engineer and Manager in 1921 and was closely connected with important reconstruction work at the Granton works, where one of the largest installation of vertical retorts was installed. Before joining the Edinburgh Gas Department, he was Assistant Engineer at Dunfermline and Greenock. He was appointed Engineer and Manager at Edinburgh in 1933, and has taken an important part in the national affairs of the Industry. In 1943 he was elected President of the Institution of Gas Engineers, being the first Scotsman to be appointed to that office since 1911, and it was a matter of great regret that war conditions caused the cancellation of the meeting which was to have been held at Edinburgh. In the same year he was appointed Regional Gas Engineering Adviser for Scotland. Among his other honorary appointments were those of Chairman of the National Gas Council for Scotland, Chairman of the Regional Gas Engineering Advisory Board, and Chairman of the Co-operative Tar Scheme. He is a Fellow of the Royal Society of Edinburgh. In announcing Mr. Jamieson's retirement, the Chairman, Councillor Airey, said he had enjoyed the complete confidence of the Committee and the goodwill of the staff, and his retirement was an occasion for great regret.

Letters to the Editor

Triple Process of Gas Manufacture

DEAR SIR,—In your issue of Aug. 26, 1936, pp. 487-488, you published a Paper by Mr. Kirkhope, of the Vancouver Gas Undertaking, on the adaptability of chamber ovens for the "Triple Process" of gas manufacture.

I have at my works here adopted this method with success. I strongly recommend to all engineers who have intermittent vertical chamber ovens the adoption of this method, for I can substantiate all that Mr. Kirkhope claims. I shall be pleased to give any interested party further information. Yours faithfully,

R. VEVERS SCOTT,
Engineer.

Canterbury Gas and Water Company,
39, Castle Street, Canterbury.
Dec. 19, 1946.

Impedance of Meter Valves

DEAR SIR,—I would reply to the letter of Mr. Riley, of the Morgan Crucible Co., Ltd., printed in the "JOURNAL" of Dec. 11, which has regard to remarks in my recent Paper "Impedance of Meter Valves" appertaining to graphite faces fitted to meter valves.

The statement to the effect that in one instance the graphite facings completely disappeared after the meter had passed 300,000 cu.ft. was made, not from my own personal experience, but from reliable information received. I can only agree with the suggestions of Mr. Riley that the explanation probably lies in either imperfect attachment of graphite facings to the valve, or in the use of a variety of graphite or graphite material not entirely suitable for the purpose. Since presenting the Paper I have had the opportunity of examining valves pressure-moulded in one piece and made of graphite composition. They appeared very hard, light in weight, and would probably be chemically inert to constituents and any impurities in town gas. They had a remarkably good working face and altogether I was most favourably impressed.

A new meter fitted with these valves has been bench tested, with results indicating remarkably low pressure absorptions over the full range. This same meter is now on test under normal working conditions on the district, and I look forward to an examination and further test after a period of working. Yours faithfully,

H. JOHNSTON,
Deputy Engineer and Manager.

Bradford Gas Department.
Dec. 20, 1946.

The Le Flueve System

DEAR SIR,—We have noted with interest your Editorial on "Trends in Mechanical Handling" ("JOURNAL," Oct. 23) and in particular the subsequent correspondence published in your issues of Nov. 20 and Dec. 18 having reference to the advantages and disadvantages of the above system as compared with the drag bar conveyor, and although we have no particular desire to enter into the controversy, we should like to take the opportunity of referring to the concluding remarks contained in the letter from Mr. C. A. Deas, of New Southgate, published in your issue of Dec. 18.

Other recognized methods of handling hot coke from horizontal retorts, although left unnamed, are referred to and it is inferred that the above system stands commended until some better system both technically and economically has been evolved.

One recognized method although perhaps not included by Mr. Deas for the reason that it may be unknown to him, is the system introduced by us in which a machine travels on a track along the stage in front of the retorts and receives the coke at "pushing" speed, quenches it, and discharges at points along the stage as may be required to suit the existing conditions.

We contend that this system is both technically and economically ahead of either the Le Flueve and drag bar conveyor systems, and since the first was installed in 1925 and incidentally still at work, no better system has been evolved.

As Mr. Deas suggests, he has had, for the reason given, every opportunity to judge between *the* two systems, but this qualification would hardly appear to justify the assertion made in conclusion unless every other system has either been experienced in use or examined.

We would therefore respectfully ask Mr. Deas to examine our system, always assuming that it was unknown to him at the time.

Meanwhile we should like to express our agreement with the views expressed by Mr. Fox, of Messrs. W. J. Jenkins & Co., Ltd., in the concluding paragraph of his letter published in your issue of Nov. 20, as the result must stimulate developments to the advantage of those on the manufacturing side of the Industry. Yours faithfully,

J. A. RIDE,
Ride & Bell, Ltd.

Retford, Notts.
Dec. 21, 1946.

Gas Stakes Its Claim

"Give us the opportunity and we will finish the job" was the theme of the contribution made by the Cambridge University and Town Gas Light Company to a building exhibition organized by Messrs. Travis and Arnold, a prominent firm of builders' merchants. Arranged on an ambitious scale, the exhibition provided an opportunity to view many types of appliances and fittings suitable for installation in the modern home. Prompt action was taken to ensure that the claims of gas were not overlooked, and in planning the display, every inch of the space allotted to the Gas Company was used to the best possible advantage.

A complete range of the latest gas equipment, covering every aspect of domestic fuel requirements, was on view, being supplemented by the British Gas Council's miniature kitchens, &c., which were loaned for the occasion. These created much interest as they served to demonstrate the volume of research work which had been undertaken by the Gas Industry in evolving appliances which combine efficiency, utility and attractive appearance, and also how gas equipment can be effectively incorporated in designing a new home or when making alterations to the existing domestic arrangements.

The exhibition was open during the first three days as a trade show and the general public admitted for the following 10 days. Invitations were issued to the Borough and County Members of Parliament, the officials of the Cambridge Borough and County Local Government Authorities, together with members of the appropriate Housing Committees and also to a large number of architects, builders, and plumbers in the Eastern area.

Diary

Jan. 7.—Institution of Chemical Engineers: "Chemical Engineering Aspects of the Fischer-Tropsch Process," C. C. Hall and A. H. Taylor. Burlington House, 5.30 p.m.

Jan. 8.—Institute of Fuel (North Western Section): Discussion of Reports of Coal Industry Joint Fuel Efficiency Committee; opener, R. G. Evans. Engineers' Club, Manchester, 2.30 p.m. (Luncheon, 1 p.m.)

Jan. 10.—London and Southern District Junior Gas Association "Consumer Service—Deeds, not Words," J. A. Marwick. Gas Industry House, 7 p.m.

Jan. 11.—Scottish Junior Gas Association (Eastern District): Short Paper Day.

Jan. 13.—Women's Gas Council: Executive Committee, Gas Industry House, 1 p.m.

Jan. 14.—British Gas Council: Central Board, Gas Industry House, 2.30 p.m.

Jan. 14.—National Federation of Gas Coke Association: General Committee, Gas Industry House, 10 a.m.

Jan. 14.—Midland Junior Gas Association: "The Distillation of Tar and Benzole," Roland Scott (Midland Tar Distillers, Ltd.).

Jan. 15.—B.G.C. Domestic Development Committee, Gas Industry House, 2 p.m.

Jan. 16.—Solid Smokeless Fuels Federation: Executive Committee, Dorchester Hotel, 11.30 a.m.

Jan. 18.—Manchester and District Junior Gas Association: "Corrosion on Gas-works," A. J. Brandram (United Kingdom Gas Corporation).

Jan. 22.—London and Southern District Junior Gas Association: Visit to Neasden Works of Ascot Gas Water Heaters, Ltd.

Jan. 23.—Industrial Gas Development Committee, Gas Induatry House, 10 a.m.

Jan. 25.—Western Junior Gas Association: Prospective Industrial Paper.

Jan. 25.—Yorkshire Junior Gas Association: Discussion, Wakefield.

Jan. 28.—Southern Association of Gas Engineers and Managers (Eastern District): "The Principles of Purging Gas Plant and Holders," L. Silver. Gas Industry House 2.30 p.m.

Jan. 28.—Midland Junior Gas Association: "Industrial Heat Treatment," L. D. Creedy, Birmingham.

The Largest Single Contract for Road Signs yet placed in this country has been received by Gowshall, Ltd., for erection at Westminster. The order is for 600 gas and 600 electrically illuminated "Keep Left" guardposts designed according to the Report of the Departmental Committee on Traffic Signs and approved by the Ministry of Transport. The guardposts are 4 ft. high, both the upper and lower glass panels being illuminated. The bodies are of ⅛ in. thick steel plate, with cast iron caps, cast silicon aluminium front glazing frames, and three-ply safety glass panels are fitted throughout.

Modern Developments in Coal Carbonization*

By C. A. POULSON, M.I.Mech.E., M.Inst.Gas E., F.C.S.,
of West's Gas Improvement Company, Ltd.

Mechanical Producers

As manually charged retorts disappear so must the hand clinkering of producers be replaced by mechanical means. For some years past, notably on the Continent, outside producers have been installed, but they have proved themselves costly both to operate and to maintain, and their adoption in this country has never been widely favoured. The outside producer lacks efficiency due to the cold gas it supplies. Its initial cost is high since a complete standby plant is required, it is more sensitive to variation in fuel which must be consistently graded and of good quality, its maintenance and labour charges are heavy, and it occupies a very considerable ground area.

The need, therefore, for a mechanical producer without these disadvantages and to supply a hot clean fuel gas, has long been felt, and I should like to describe to you briefly a new mechanical producer, forming an integral part of the vertical retort setting, which has been recently developed and promises to become yet another highly efficient adjunct of the modern carbonizing process. This "cleaned hot gas" mechanical producer has achieved a degree of efficiency beyond what had been hoped. The simplicity of its adjustments and its general performance will, I believe, satisfy the most stringent technical demands.

It has been conclusively established that the automatic operation and control of producers tending to eliminate the personal factors, offer very distinct advantages which will be reflected not only in the actual producer efficiency but also in plant operation and the general standard of results obtained. To maintain efficient operation of mechanical producers the use of instruments becomes essential. With their assistance the operator can detect any changes immediately and the conditions can be rectified promptly. Even under the best conditions the natural draught type producers can vary in operation very considerably, and the CO curve declines drastically each time the producer is open for cleaning or pricking, with a consequent loss of efficiency.

With the mechanical producer it is possible to produce a surprisingly steady quality and quantity of CO, the effect of which raises the overall efficiency materially. One of the outstanding advantages of this producer, too, is that the speed of throughput or the rate of gasification can be varied over a wide range without unduly sacrificing gas quality.

In ordinary producer practice the best natural draught producer operation would only give an efficiency of not more than 50%. With the mechanical producer this efficiency has been increased to almost 90%. So promising are the results from the unit that, coupled with automatic ash removal they will doubtless become a regular feature of modern carbonizing practice.

Over the past many years an immense fund of data and information on producer practice covering numerous designs has accrued, and a survey of this wide experience has produced several leading essentials of efficient and economical producer design, which can be summarized briefly under the following headings:—

(1). Correct and constant fuel bed temperature.
(2). Regular quality and volume of CO.
(3). Hot and clean producer gas.
(4). The ability to use varying qualities of fuel.
(5). Easily adjusted automatic control and flexibility of output.
(6). Maximum fuel efficiency.
(7). Compact design and low maintenance costs.

*Extract from a Paper to the Scottish Junior Gas Association, Eastern and Western Districts.

To combine these requirements considerable experimental work has been entailed, but it can be claimed to-day that a satisfactory design shown in section (Fig. 1) has been produced to suit the exacting requirements of the latest vertical retort setting. Steam and air in correct ratio are admitted beneath the grate. The air is substantially preheated by utilizing the heat of the producer walls and employing an air jacket. Equipment is provided so that the technical operator has the ability easily to adjust the flow of air beneath the grate to give the necessary volume of gas and a wide range of steam control permitting adequate adjustment of the temperature of the fuel bed to suit the ash-fusion properties of the particular coke being supplied to the producer.

The new producer arrangement shown in Fig. 2 is positioned as an integral part of the setting, exactly as at present, with two exceptions:—

(1) The dimension from the producer wall is greater than that of an ordinary producer, but can be accommodated within an existing retort house.
(2) The new producer is capable of supplying more than one setting.

For a battery of settings one producer is provided for each two settings, with one spare, so that a bench of six settings would normally have four producers. Its principle is that a specially designed ash-extractor at the base of the fuel chamber is rotated at a speed which can be varied considerably as required to suit different classes of fuel, and to give a wide range of fuel gas output according to the duty required.

The driving unit comprises a reciprocating oil-hydraulic gear, the arm of which engages a robust rack to give movement to the grate. Other methods of rotation can be applied, but the advantage of the specially designed oil-pressure drive is that it allows automatic operation of the grate either continuously or intermittently. As the grate rotates, ash and clinker fall into a lower chamber, from which they are directed mechanically into a receiving hopper of suitable capacity. The conveyor beneath operates intermittently as required, and transports the cleanings to an outside hopper for disposal.

This mechanical producer will operate satisfactorily over a wide quality range of coke, but as would naturally be expected, if charged with a large percentage of fines its output is correspondingly reduced.

Suitable means, described later, are now available successfully to consume all the below ¼ in. or ⅜ in. fraction of coke, but it is not economical in producer practice generally to include the fines, containing probably 25% ash, which increases clinker formation, channelling in the fuel bed, and short circuiting of the air through it, with consequential deterioration of producer gas quality, besides increasing the risk of dust being carried forward to the setting. To reduce the last-named evil a dust extractor is associated with the mechanical producer. This has proved to have an extraction efficiency of 70%. The travel of the gas from the producer to the setting through the dust extractor is short and therefore only a negligible temperature drop is occasioned. The producer and dust extractor are completely insulated and, due to the fact that the producer gas is taken off through a central flue within the producer, the fuel bed is maintained at a constant thickness and the maximum amount of heat is retained in the gas, and exterior heat losses are thereby reduced to an absolute minimum.

The following table shows the results obtained with the mechanical producer from coke as made and supplied by the Manchester Corporation Gas Department.

Summary of Test on Mechanized Producers

FUEL. ("Coke as made").

Weight consumed: 5.5 to 6 tons per 24 hours.

Grading:	%	%
Above 3 in. ..	1.4	6.8
2 in.-3 in. ..	17.8	23.1
1½ in.-2 in. ..	34.2	31.1
1 in.-1½ in. ..	24.7	12.8
¾ in.-1 in. ..	13.7	11.4
Below ¾ in. ..	8.2	14.8

Analysis: Moisture 1.0%
Ash 7.5%

Calorific Value: 13.270 B.Th.U. per lb.

PRODUCER GAS. Volume (at 60° F. and 30 in) per ton of coke 179,200 cu.ft.

Temperature at outlet producer .. .. 820° C.
Temperature at outlet dust extractor .. 790° C.

ANALYSIS.

CO_2	5.5%
CO	25.5%
CH_4	0.6%
H_2	9.8%
N_2	58.6%
	100.0%

Maximum variation in CO content per 24 hours, 1%.

Calorific value: Calculated 121 B.Th.U.per cu.ft.
Measured 123 B.Th.U. per cu.ft.

ASH.

Analysis.

Analysis: Moisture 17.0%
Carbon 14.7%

DUST.

Total in gas .. .. 3.15 lb. per ton of coke
Removed by dust extractor 2.20 lb. per ton of coke
Efficiency of dust extraction .. 70%

Grading:

Above 20 mesh 1 mm.	0.6%
Above 30 mesh	4.1%
Above 60 mesh	8.5%
Above 80 mesh	17.7%
Through 100 mesh	12.3%
Above 100 mesh	56.8%
	100.0%

Analysis:

Carbon	81.1%
Ash	18.9%
	100.0%

EFFICIENCY OF PRODUCER.

Hot gas efficiency 89.5%

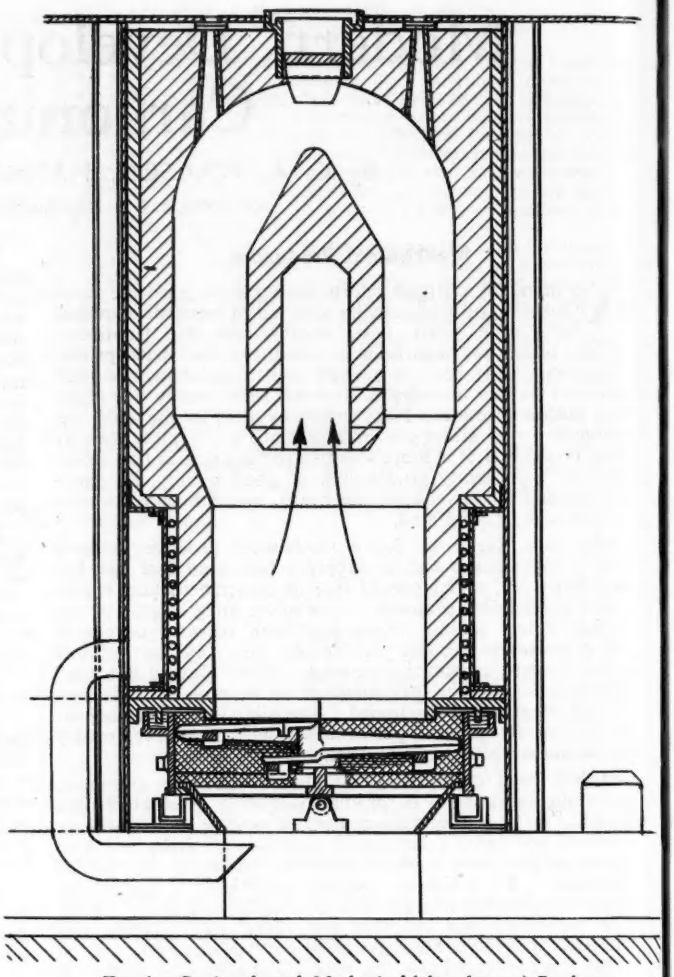

FIG. 1.—*Section through Mechanical (clean hot gas) Producer*

The Sector Discharger

The extraction of coke from the vertical retort has received continued thought, and numerous trials along completely new lines have been made on what we know to-day as the sector discharger.

The modern method of discharge has to obviate the breakage of coke, and has to allow for varying conditions both as regards rate of extraction while dealing with a broad range of coke sizes. It must be designed to prevent the running of small coke, particularly in these days of using a considerable proportion of non-caking and stock coals. The method used must be able to handle with equal ease all coals of widely varying characteristics, particularly as we are unlikely to see again a continued flow of the same quality coal in gas-works as hitherto. Future systems must provide increased flexibility of gas output per unit, while retaining the ability to produce gas at varying calorific values by alteration of the volume of steam at the base of the retort so that the products of distillation are diluted by the introduction of more or less water gas.

The sector discharger has been operating experimentally for some years at Liverpool, on Midland and Lancashire coals, and more recently a trial unit has been put into commission successfully at Newcastle, where they are using 100% Durham unscreened run-of-mine coals with as much as 60% through ½ in. A unit has not yet been applied in Scotland but judged from its performance over a long period, it promises to obviate retort poking almost entirely, apart from cleaning the top ironwork, when carbonizing Scottish coals. This will be of special interest because upon this important operation many more things depend. Mechanical rodding of retorts has often been suggested but its development has been generally abandoned; it is a problem which bristles with mechanical difficulties. It will be far better if rodding can be dispensed with altogether or at least reduced to a mere inspection to ascertain that the charge is going normally down the retort.

Figure 3, A, B, and C, illustrates the position of the sector.

A. The sector in the "at rest" position. From this illustration complete absence of running of the charge will be readily appreciated.

B. Shows the sector after having discharged its definite volume of coke into the lower receptacle, after which the sector swings back to the "at rest" position.

C. Illustrates the sector swung completely over to allow clear vision of an empty retort for inspection or repairs.

From these operations it will be seen that there is very little risk of breakage and, therefore, extraordinary little breeze formation. By this method too it was not only hoped to produce a better coke yield per ton, but also to effect the production of a slightly harder and a larger coke.

A series of mechanical tests was made and the following two sets of figures have been selected.

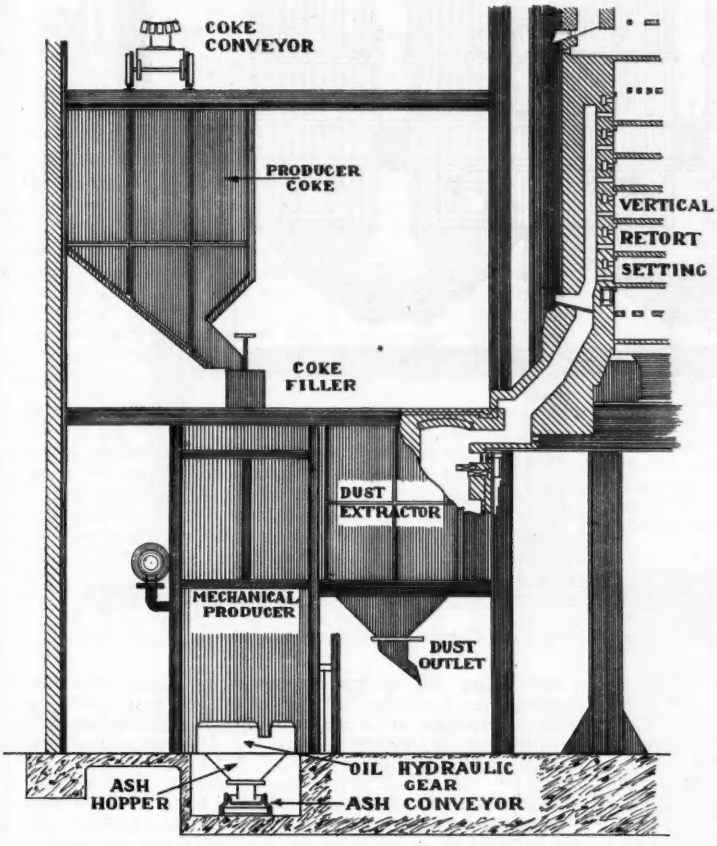

FIG. 2.—*Mechanical Producer and Dust Extractor showing Arrangement for Coke Filling with Automatic Ash Extraction and Conveyor*

Comparison of Coke Sizes

Report—Dec. 24, 1941:

Grading test made when carbonizing "Glapwell" and "Hickleton" Nuts.

	Continuous verts	Sector discharger
Coke above 2 in. mesh ..	31%	44.76%
Coke above 1½/2 in. mesh	19%	22.02%
Coke above 1½/¾ in. mesh	21%	19.52%
Coke above ¾/½ in. mesh ..	12%	6.85%
Coke below ½ in. mesh ..	12%	6.85%

Report—January 3 1946:

Grading test made when carbonizing "Midland" Nuts for the production of "Dryco."

	Continuous verts	Sector discharger
Coke above 2 in. mesh ..	20.65%	37.60%
Coke above 1½ in. mesh ..	17.90%	19.20%
Coke above ¾ in. mesh ..	40.00%	28.80%
Coke above ½ in. mesh ..	9.55%	6.60%
Coke and breeze below ½ in.	11.90%	7.80%

A downward movement of the whole charge of about 18 in. over its entire cross section every 40 minutes is, indeed, the equivalent of the retorts being rodded 36 times a day since this movement creates a complete disturbance of the charge at regular intervals and so provides free and natural gasways. This is mentioned particularly because all expert carbonizers know well the advantages of regular and methodical rodding.

The fact that a drop in the charge of some twelve to fifteen inches obviates the formation of those obstructions which necessities rodding is capable of explanation. In the process of carbonizing the gas passing through the coal at the top of the retort deposits some pitchy matter which causes a sort of paste which tends to stick to the retort top. When the charge is in continuous descent this deposit tends to grow until rodding is

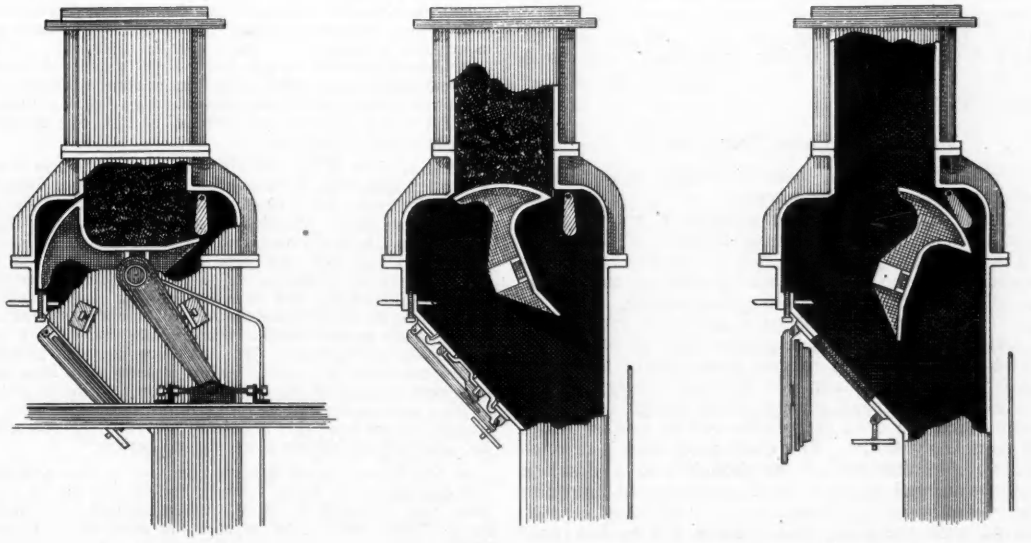

FIG. 3.—*Sector Discharger showing positions of Table*

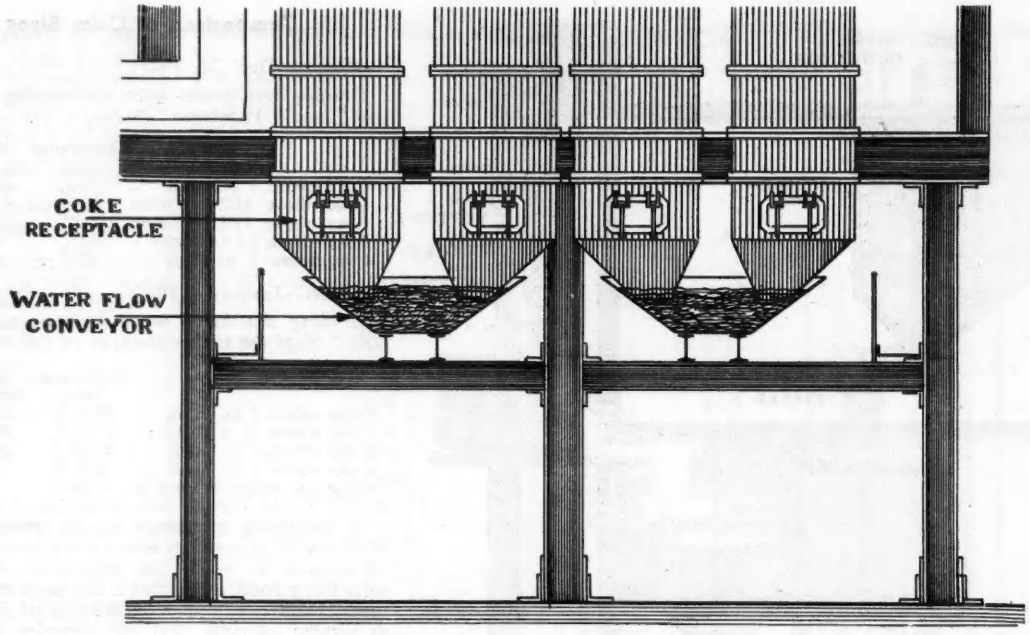

FIG. 4.—*Outline of the Water Flow Conveyor*

necessary to dislodge it. But if the deposit is kept stationary for a short time it hardens into the initial stages of coke formation and its adhesion to the retort wall diminishes. If now the charge is dropped through a substantial distance it will slide over the retort surface leaving the surface clean.

The operating gear, which is simplified to a surprising degree, comes into commission only once in approximately 40 minutes and is actuated by oil-hydraulic cylinders neatly positioned at the end of the bench. The gear is smooth and silent in operation. The operating levers of the individual retorts are coupled together by steel longitudinal members attached to the piston of the oil-hydraulic cylinders. Each line can have its own pressure cylinder or they can be operated in pairs, timed to come into action intermittently so that even distillation, and hence regularity of gas production, is maintained throughout the plant as a whole.

The timing of the operations, which can be varied over an adequate range, is accomplished through adjustable delay switches operating automatically, which set in motion the electric motors providing the oil pressure. A reverse movement returns the sectors to the "at rest" position and the gear cuts out until the next similar operation. Provision is made so that each retort can be isolated from the line for scurfing or repair periods.

The Water Flow Conveyor

A new method of dealing with discharged coke is now in an advanced stage of development.

Figure 4 illustrates this unique method of receiving the discharged coke from the retorts and combines many advantages. The outstanding feature is that the retorts are always water-sealed. Thus no air is drawn into the system, by the chimney effect of the retort, when discharging. This is important because it will produce a gas of a lower inert content and will tend towards a general balance of quality. It will also permit of more regular governing of the plant, as the conditions will remain continuously steady. Briefly outlined, this development consists of a trough containing water into which the coke receptacles extend and in which they are completely sealed. The discharged coke is directed by water flow to the end of the trough into a drainage hopper superimposed upon a band conveyor to transport the coke to the screening plant.

Compared with previous systems there will be less wear and tear on the conveying plant, particularly underneath the bench where probably 50% of the wear and tear of coke-handling plant takes place. The new system is a complete solution of the dust problem and conditions within the retort house are immensely improved. The obviation of bunker fires is another of the advantages, particularly desirable and necessary in works making special coke of high volatile content, or in the case of undertakings producing higher qualities of gas.

And finally the new system cuts out another of the manual operations in the retort house process, a saving which should be reflected in a reduction of the cost of gas into holder.

National Insurance Act.*

The National Insurance Act, 1946, which received the Royal Assent on Aug. 1 provides for a unified and comprehensive scheme of national insurance which will eventually cover practically everyone in Great Britain and will give sickness, unemployment, maternity, widows', guardians', retirement, and death benefits. The Act, which will not come into force until the appointed day or days, replaces the existing national insurance schemes with a more comprehensive system, and repeals or amends the existing statutes which deal with unemployment, national health, widows' and orphans' and old age contributory and non-contributory pensions.

Effect is given to the main proposals contained in the Beveridge Report, though they are modified in many important matters, and the Act embodies the principle of universality. It brings everyone inside it, including those formerly above the income limit, those exempt because they were substantially free from insurable risks and those exposed to risk but who were outside insurance. In addition it abolished special arrangements such as those for unemployment in agriculture, banking, and insurance, though supplementary schemes may still be approved under the Act. There is no "contracting out," except in the case of people receiving less than £104 a year and of certain married women. The Act recognizes that it is undesirable to peg benefits to the cost of living, impossible to fix a general level of benefit covering all the varied needs of individuals, and impossible to fix a general level which will cover variations in rent. It is constructed on the basis that practically everyone between school-leaving age and pensionable age is an insured person.

In Mr. Potter's book there is contained a comprehensive general introduction to the Act as a whole, and the full text of the Act annotated and explained in detail. In an appendix are included three recent Orders which alter benefits and contribution rates under the existing law.

* "The National Insurance Act, 1946, with General Introduction and Annotations," by Douglas Potter, M.A., Inner Temple and South-Eastern Circuit, Barrister-at-Law. Butterworth & Co. (Publishers), Ltd., 21s. (by post 21s. 10d.).

Silver Jubilee of Cast Iron Research*

By HAROLD HARTLEY, D.Sc.

AN immediate effect of the first world war was an appreciation by industrialists of the need for a scientific analysis of technical problems. The British conception of research associations seemed to offer a means of dealing with these by co-operative effort peculiarly suited to our national character. The work done in the three decades since the initiation of the idea is testimony to the merit of the scheme put into operation in 1917. The British Cast Iron Research Association was incorporated on June 1, 1921, and some of the subscribers to the Articles of Association still take an active interest in our affairs.

We have chosen this annual meeting to celebrate two anniversaries, namely, the Silver Jubilee of the B.C.I.R.A., and the coming-of-age of Mr. J. G. Pearce as Director. This Association, while not among the largest of those aided by the Department of Scientific and Industrial Research, is of effective size and has been developed in such a way as to retain the approval, not only of the industry itself, but also of the Government Department which sponsored its birth. The first few years of its existence was a period of tribulation, but after 1924, when the first laboratory was opened, signs of progress became more apparent. The present Director actually took charge in February, 1924

Move to Bordesley Hall

The premises in St. Paul's Square were occupied in 1927 and although enlarged three times, remained the headquarters of the Association until the move to the present site at Bordesley Hall at Alvechurch in 1942. In 1925, by amalgamation with the Falkirk Institute, our Scottish members were provided with a service laboratory, and in 1945 this was extended. It is operated under the guidance of a Scottish Sub-Committee of the Council.

At the time Bordesley Hall was purchased, the total income of the Association was of the order of £25,000 a year. The Hall and the fifteen acres of land which were acquired cost some £10,000. As offered for sale there were included 267 acres and it might not have been possible to secure our new headquarters but for the help of my immediate predecesssor as President, the late Mr. Percy Pritchard, one of whose companies purchased the whole of the estate and let us have the part required at valuation, loaning the money, free of interest, for the twelve months needed.

The capital assets of the Association valued at cost now amount to approximately £50,000—the liquid reserves are small, but there are no liabilities.

Aims of the Association

Briefly, the aims of the Association are to find means of improving the quality, of facilitating the manufacture, and of extending the uses of cast iron. This object is sought by co-operation between the staffs of the member firms and the specialists it employs, and without the help of its industrial supporters—and I am not now referring to financial help—it must languish. However brilliant the Director and his staff, they need to be stimulated by contact with the heads and staffs of the subscribing member organizations. No manufacturing concern is pulling its weight if it is content merely to give financial help by paying its due subscription —the real responsibility for the efficacy of the Association lies with the members, and they must interest themselves in its work, by adding to the pool of knowledge, by serving on Committees, or by other direct and personal contact with the organization. There is more knowledge about cast iron within the four walls of Bordesley Hall than is possessed by any other single body ; this knowledge will be given to members for the asking and the best method of getting it is by personal contact.

* Presidential Address to the British Cast Iron Research Association, Dec. 10.

During the past 25 years the technique of iron founding has altered very considerably and in this development the Association has played no mean part. Up to the first world war cast iron with a tensile strength of 15-18 tons per sq. in. was exceptionally good. To-day the material is commercially available with a tensile strength of 30 tons per sq. in. and even higher. Industry has now available a variety of types of cast irons evolved to suit special requirements such as heat resistance, corrosion resistance and wear resistance.

The foundry techniques of melting, moulding and casting have been much improved and many problems connected with continuous casting in green sand and permanent moulds with mechanized plant have been overcome. The working conditions in foundries still need attention and the sections of the industry concerned will need to tackle the matter seriously if they are to continue to attract the manpower required. The industry will doubtless, in due course, have a lead from the Garrett Committee of the Ministry of Labour.

Bordesley Hall, Headquarters of the British Cast Iron Research Association.

The Research Association stands midway between the universities and industry. It does not undertake fundamental research in the real sense of the phrase, although it is concerned with investigations into the underlying factors which control the behaviour of the metal and its alloys under all practical conditions. Sir Edward Appleton has happily termed this type of work "objective fundamental research."

Were we to limit research to the solution of *ad hoc* problems, we should not fulfil our duty. If the means are available, it is desirable never to be content with the "how," but always to strive to learn "why." For many years investigations have proceeded in the Research Department to learn how molten iron crystallizes, to determine the influence of the various ingredients, and to find out why things happen as they do. In 1936 the Association made public a method showing how a fine graphite structure might be produced from a titaniferous iron. The main research has been continued and is now yielding a remarkable return.

An Important Development

It has been decided that the celebration of this Silver Jubilee provides a fitting occasion for the first public announcement of an important development effected by our research staff. My statement is to be confined to the effects which can be produced. It is most important to establish British priority in the field, and the technique cannot yet be disclosed, in part because the patent position is not yet

clear and in part because of problems relative to the supply of materials involved.

Means have been found of producing iron in the "as-cast" condition, with the graphite in nodular or spherical form instead of as the elongated flakes found normally. This structure can be obtained in a very simple way, and the effects on the properties of the castings are most striking.

a. By using a straightforward hematite pig iron, the results attained are as follows:—

(1) The "as-cast" material when subjected to strain, undergoes elongation.
1-2% for high carbon metal.
2-3% for lower carbon metal.

(2) The tensile strength, transverse strength and shock resistance are doubled or trebled. With metal containing 3.9% carbon and 2.6% silicon, the treatment causes the following increases:—
Tensile strength from 15½ to 26½ tons per sq. in.
Transverse strength from 29½ to 48 tons per sq. in.
Shock resistance from 13-47 ft. lbs.
Brinell hardness from 185-215.

The "as-cast" material possesses the properties of the best types of high duty cast iron and is obtained without the use of special compositions or the treatments necessary hitherto.

A striking feature of the material is its uniformity from piece to piece. Ten bars chosen at random from 100 cast from 4% carbon hematite pig iron showed tensile strengths which varied only from 23.8 to 24.3 tons per sq. in., the Brinell hardness varying within the range 198 to 203. In a thick bar there is little change in Brinell from centre to edge.

b. Special duty irons—these also are improved in a similar way., e.g., Ni-resist—treatment increases the tensile strength from 10 T.P.I. to 20-25 T.P.I.
Shock resistance from 30-120 ft.-lbs.
Nicrosilal—under transverse load yielded a deformation of ¼ in. in the untreated stated and 3½ in. in the treated state.

c. The phosphoric irons can also be improved, although it may be the dominant influence of the phosphorus in the high phospheric type cannot be offset—this field has as yet been little explored.

The process is successful with cupola melted metal, and another significant feature of the development is that it is most readily applicable to medium and high carbon and silicon metals—that is, to the irons which are most easily castable, least subject to shrinkage on casting and most readily machinable.

I have stressed the obvious industrial value of the work but it is possible the discovery may be of even greater significance from the metallurgical standpoint, and that when a full explanation is evolved, the boundaries of our knowledge will have been expanded.

On your behalf congratulations are extended to Mr. Morrogh and his team. They are doing first-class work.

A feature of the development that appeals to me is that it is a consequence of background research persistently pursued over a period of years.

Need for Patience

May I ask members to be patient with us if it takes our small staff some time to put the results before them and to aid them in their application. Also, users likely to be interested will appreciate that member firms must first be advised and trials made before commercial requirements can be satisfied.

Were unlimited funds available, rapid exploration would be possible of the various fields for the application of this new knowledge, which must ultimately affect the activities of every branch of the industry. In the first instance arrangements are in hand to make field tests on the high duty irons such as are used by the motor industry and some other sections. To permit of effective liaison between the laboratories and the section of the industry concerned, it is intended that a few selected foundries with competent technical staffs shall carry out production trials. Care must be taken to see that the development is well planned. Every endeavour will be made to render the experiment self-supporting as quickly as possible, but the work necessary, if the project is to be brought to fruition without undue delay, may involve considerable expenditure.

In addition to the foregoing, money has to be found for more buildings. Although Bordesley Hall has only been our headquarters for four years, extensions have been made and more are needed. The Hall is fully occupied by the staff of 60, and difficulty is being experienced in accommodating all the trainees who wish to come to us from members' works, as well as other approved students. Further, an additional 6,000 sq. ft. of space is wanted urgently for an improved chemical laboratory, a sands and refractories laboratory, a machine shop and a staff canteen. In the past, capital expenditure has been met largely by savings from current income, but if the capital expenditure needed in the immediate future cannot be met out of income, then the Council may have to contemplate the raising of a loan.

With the generous support received from the Department of Scientific and Industrial Research there is envisaged on the present basis a gross income of £50,000 a year within the next few years. The Council has it in mind that means may have to be found to enable the yearly income to be increased to £100,000.

Except for some sectional interest, it is not contemplated that existing members shall be asked to find more money, while others in the industry who must benefit from the Association's activities do not for one reason or other subscribe directly to the work. Consideration is being given to the desirability of obtaining the financial backing by means of a properly organized levy throughout the trade. We are advised that a levy less than the present subscription basis would, with the aid of our good friends the D.S.I.R., enable the desired figure to be attained. The industry is much better organized to finance a Research Organization than was the case before the war. Now there exists the Council of Ironfounders' Associations, the Council of Iron Producers and, embracing both, the Joint Iron Council, and consultations on ways and means are in progress with these bodies. Some people hold the view that for an industry with the turn-over of the ironfounding industry, £200,000 per annum should be expended on co-operative research. Be this as it may, for myself—and the Council may not agree with me—I am not anxious to see the central organization grow too large. The past success is due in no small measure to the fact that we are not of an unwieldy size, and that the Director has known what work the individual members of his staff are doing, although the actual details are the responsibility of the Section Managers. Ultimately, de-centralization may have to be considered.

Incentive to Further Progress

While celebrating the Silver Jubilee, I am hopeful that the subscribers, the Committee members, and the staff will regard the passing of this milestone as an incentive to further progress, taking care to ensure that each new step is based on previous experience. The move to Bordesley Hall, although originated because of war risk, has been amply justified, and the Council presents the annual report with confidence in the future, enhanced by an appreciation of the progressive outlook of the present Government. The technician *quâ* technician is little concerned with the questions of ownership. He does, however, ask the politician that he shall ensure the manner of organizing the country's effort, shall fully recognize the outstanding importance of the work of the specialists, and that whatever is done no steps shall be taken which will lessen the incentive to strive for new knowledge. The members of the Association being, or representing the owners of the foundries, may, in their private lives, have a more direct interest in the political views of the Government, but on this occasion all are met to do honour to the application of an idea first put into operation under a National Government, which must continue as a National effort whatever the colour of the administration in power.

Up to now we have had a sellers' market since the termination of hostilities, but already there seems to be some slackening in the growth of exports. Certainly, two or three years hence world competition will be keen. We aim to ensure

that the British ironfounding industry shall be able, if it is so desired, to export products of brain rather than brawn by maintaining our position as the pre-eminent authority on the technology of cast iron—only in this way can we feed the industry adequately with knowledge.

* * *

A commemorative booklet issued in celebration of the Silver Jubilee of the Association reviews the past 25 years' history and outlines proposals for extending the headquarters. It is proposed to add 6,000 sq. ft. of accommodation for chemical analysis, sands, and refractories, laboratories, and staff canteen, and a further stage covers mechanical testing and machine instrument shop. A single storey building will accommodate the laboratories, a development laboratory will cover pilot plant work and a radiographic unit, and a furnace building will permit the study of blast moisture and temperature in cupola melting and other furnace problems.

District Heating in Relation to Town and Country Planning*

By W. G. HOLFORD, A.R.I.B.A., M.T.P.I.
Lever Professor of Civic Design at Liverpool University

TOWN and Country Planning is a co-ordinating activity which covers the various developments and uses to which land may be put. It is concerned with estimating and controlling—in the public interest—the amount and rate of development produced by building demand, agriculture, and mineral working; and it is also concerned with the social consequences that arise from the adoption of a particular plan or programme.

District heating, as a comparatively new element in this picture, is of particular interest to the town planner for two reasons; first, because, as a service, it offers immense opportunities for improvement in amenity, convenience and public health; and, secondly, because it sets certain physical and economic problems which require something more than good engineering to solve them. These problems are serious because they are relatively permanent in character and affect the distribution of homes, offices, and factories as between town and country. It stands to reason that a public utility provided at high capital cost, taking a long time to construct, requiring rights of way under the streets for its distribution, and mass-consumption for its economic operation, will be a long-term investment and will tend to stabilize the layout of the houses or factories which it serves. This involves questions of location, of plan-forms, of building, and of rent; and therefore the subject is one in which planner, engineer, architect and housing manager must co-operate.

First, then, let me outline very briefly the advantages of district heating from the planning point of view.

The Main Advantages

The main advantages which the public would derive from rational and efficient large-scale heating systems, are the indirect ones, and these are the most difficult to assess in terms of cost. The greatest is probably the reduction of fog and smoke. Town planners look with envy at the sites of new towns in the Mediterranean area because they are free from atmospheric pollution; architects see their buildings reduced to drabness within their own lifetimes owing to the effects of black smoke and sulphur dioxide; and the average householder no longer reckons smoky chimneys as signs of prosperity, but associates them with black towns, and depressed areas, and tries to find a house where the curtains will not need cleaning every week. But these likes and dislikes are nothing compared with the toll of disease, discouragement, and death which is all the time being paid in the background. There are towns where the death rate and the incidence of fog are equally high from the middle of November to the middle of January. There are whole regions of Britain which a prolonged damp season reduces health and impairs efficiency. On the other hand, I know of a damp valley in County Durham where fog has been practically eliminated through the centrally heated factories and offices. A little heat in winter, and fresh air and sunlight all the year round, are the greatest amenities which a town planner could wish to secure, both in the development of new towns and residential neighbourhoods, and in the re-development of slums and derelict areas.

* Paper to the Conference "Fuel and the Future" organized by the Ministry of Fuel and Power

Next comes the interesting question of zoning. One of the problems of planning is to group similar activities and uses together for the sake of convenience, common services, and protection from conflicting types of development, and at the same time to prevent such huge segregations of houses or factories that workers have to travel a long way from their homes, and the districts themselves become monotonous and unsociable. So we usually try to avoid the indiscriminate mixture of factories and houses (such as you see, for example, at Stoke-on-Trent or in parts of London), and at the same time bring the factory zone as near to the residential zone as possible. If you look at some of the French garden-cities, such as Châtenay Malabry, or at the provisional plan for the new town of Stevenage, in Hertfordshire, you will see compact residential neighbourhoods with schools, public buildings, and small shops and workshops in each, but you will also notice well defined shopping and factory areas close by.

To achieve this kind of planning you need clean factories—even when they are situated to windward of the houses; and both the industrial estate and the residential neighbourhoods with their community buildings are of a size and character to take full advantage of a central source of power which would provide space-heating, hot water and possible process steam as well. It is true that factories are so quickly altered and extended that a district heating scheme may prove too inflexible for economy; but each case should be at least considered on its merits. It is worth noting that the final report of the New Towns Committee* under the Chairmanship of Lord Reith, basing its recommendations on information supplied by the District Heating Sub-Committee of the main Heating & Ventilating Committee of the D.S.I.R. says that:—

> "... district heating may be already accepted as entirely practicable in a commercial or industrial area. We think this may apply also to a domestic area with a density as low as 10 houses to the acre. In our view the time has arrived for a full scale test ... in one of the first new towns."

Saving of Storage Space

The next advantage that calls for consideration from a town planning point of view is the simplification of coal supplies and deliveries in built-up areas, and the reduction of the space at present devoted in every building to fuel storage and individual heating systems. Central heat on a metered or a rental basis, supplied from a thermal or thermal-electric station which is strategically located, would eliminate the need for a considerable number of lay-bys, loading docks, chutes, hoppers and fuel bins, boiler houses, chimneys and flues, stokers and cleaners.

The economy in building is also considerable, where background heating is provided from a central source, and flues are required only for ventilation, or for small apparatus

* Cmd. 6876 H.M.S.O., price 1s. 3d.

used for "topping-up." This is particularly true of large office buildings, though the reduction in brickwork or masonry in the chimney breasts and flues of small houses is also considerable.

Anyone who has had the misfortune over the last few years to work in an office which depends for its heat on the regular stoking of a bituminous coal fire and on its raking out and relaying every winter morning, or who has herself had to perform this operation at home, will not need telling of the disadvantages of the system: the dust and grit, the time-consuming drudgery, the irritation it entails. Demands on our productive capacity are increasing, so is our own demand for leisure and for social and civic activities; domestic service is completely different from what it was before the war, and millions of families are in need of new houses. In such a situation, convenience and labour-saving methods become increasingly important; and a planning scheme which does not contemplate adding to water supply, sewerage, and power supply, the additional service of district heating and clean air, is one which is looking backward instead of forward.

The Question of Cost

In the first place, and in common with all improvements in the standard of living, this new service has not only a high capital cost but will impose a constant addition to rent and rates in the form of standing charges. Where a poor householder could make desperate economy by denying himself a coal fire altogether, he will not be able, in any particular week or month, to turn off the district heating. There must be general acceptance of the service in the area of operation; and if there is a strike or a breakdown and such things are not unknown in the best regulated systems—all the consumers suffer together. But this is the price of progress, and to advance these as reasons *against* the adoption of a district heating system would be a policy of bankruptcy. Moreover, as Mr. Donald Smith remarked, in a paper to the Royal Sanitary Institute in 1944:—

> " . . . So far from being a burden, a correctly designed system can give more heat at less cost than any other system, and can be operated at a profit. In fact, if the real cost of housing is to be reduced, this method, on account of the annual savings obtained, is equivalent to a subsidy of from £100 to £220 per house."

Nevertheless, the capital cost is high, and interest and sinking funds have to be met. There is no sense in not facing up to this fact, which is, of course, common to all large-scale enterprises and not incommensurate with its benefits. The scheme outlined by Mr. Stubbs, for a town of a quarter of a million inhabitants, would cost £10,000,000, but would supply heat at about 5d. per therm at 1937 price levels, and would save 48% of the present fuel-consumption of such a town on heating and hot water supply for buildings of all types.

Distribution

The second problem is one of distribution. Mr. Margolis will tell you of actual examples on the Continent where heat has been economically transmitted from a station six miles outside the area of supply. It is reasonable to suppose that in a well-designed system it could be conveyed up to two miles with a loss of only about 2%. But whether the source is central or outside the town, the distributing mains must pass under a considerable length of verge or pavement before they reach the house, or office, or factory of the consumer. In a few old towns, for example in some streets of the City of London, there are large ducts capable of carrying these mains without further negotiation, tunnelling and excavation; but in the majority of towns, especially in those where clearance due to war damage, slums or obsolete property is not complete, one of the greatest difficulties is likely to be the positioning of these mains and the actual provision of space for the pipes and their insulation in conduits or tunnels.

The moral is clear. If heat is to be seriously considered, along with other essential services, in re-development schemes, the layout, density and detailed site-planning of the area should not be settled without reference to the heating engineer. If this is true in new schemes, where great economies can be effected by the adoption of a layout which is equally satisfactory from the planning and the heating point of view, it is equally necessary in rebuilding schemes in the central areas of towns, where the problem is more difficult and technical co-operation is absolutely essential. You will hear shortly that it is already taking place at Birmingham, at Manchester, at Coventry, and in the City of London.

A further difficulty is the acquisition, in large built-up areas and in towns of high architectural and historical importance, of suitable sites for the power stations, particularly for large thermal electric stations with chimneys perhaps three hundred feet high. From all points of view, physical, economic and aesthetic, it is the problem of *re*-development and the adaptation of a new system to existing streets and buildings, that is the more difficult of the two. But it is by no means insoluble. A power station functionally designed, built in pleasing materials, and with its coal-handling plant carefully sited to avoid unnecessary dust and disturbance, can be an architectural asset. But if its size and character are clearly incompatible with the development of the area it is intended to serve, the cost of placing it further away and of increasing the length of the distributing mains must be squarely faced. We must be prepared to pay for amenity wherever we consider it really worth while.

As for re-development in stages, there will obviously be a loss of efficiency in several small thermal stations as compared with one large station, and more fuel is likely to be consumed proportionately. But the linking up of several stations, each designed to serve in turn a section of the whole area to be re-developed, may be the only practicable method in our older towns.

The Factor of Scale

It is evident to everyone by now that services can be provided efficiently and cheaply for a large unit of building, under one ownership or management, whereas they are usually uneconomic for small units operating independently. The great 18th Century landlords, for example, were able to lay out estates of some size and dignity, both in town and country, with good accommodation and services and a high architectural and landscape quality.

Local authorities, by virtue of the Housing and the Town and Country Planning Acts (particularly the Planning Act of 1944), are now placed in more or less the same position to carry out large scale development. In the centres of existing towns, they are faced with the task—and the opportunity—of promoting under unified ownership and control the national and efficient development of hitherto unrelated properties. It is not unusual to find 20 to 30 buildings on an acre of ground, each with its own staircases, passages, light wells, entrances and chimneys. On the same acre could be erected a building, individually designed but harmonious with its neighbours, containing the same or greater floor space, with better light, more direct circulation, improved resistance to fire, and even space for car-parking and a row of trees.

The whole tendency of planning legislation is towards comprehensiveness and the raising of standards all round. The significant detail can often receive greater attention at the hands of someone concerned with mass-production or large-scale development, than at the hands of the small owner or lessor with fewer resources.

The same principle must, I think, apply to such an essential service as heating. The individual should be better served, the community better housed, and the national resources better used, if heating is organised on the scale of the town or district rather than on the scale of the single building or even the single inefficient open fire.

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District Heating—Continental Practice*

Br A. E. MARGOLIS, Dipl. Ing.

THE development of district heating on the Continent after the war of 1914-18 has been facilitated by the shortage and high cost of coal. In 1921, the Hamburg Electricity Company and a leading heating firm formed a company for public heat supply. The success of this company encouraged many towns in the following years to take up district heating. Many plants were on a small scale, owing to the economic limitations of district heating at that time.

The predominant method of heating on the Continent is by slow combustion stoves with a thermal efficiency of 40 to 50% as compared with 20-25% for open coal fires in this country. In consequence of this, the saving that can be attained by the introduction of central heating installations is less than would be the case in this country. Moreover, the installation of central heating in an existing building involves many difficulties, and as a rule a district heating plant had to be designed for the heat supply of existing central heating plants only. Evidently, heat could not be distributed in streets where only one out of ten buildings could take the supply. No service, even electricity supply, could be run under such conditions. It is also obvious that a district heating service could only be successful if the heat was supplied at a lower rate than the cost from central heating boilers. This explains why the district heating service had at first to be limited to favourable areas of a town with an adequate proportion of central heating installations.

According to my experience as Manager of the District Heating Company in Hamburg and as the engineer responsible for many other schemes in Germany and other countries, the new service has been appreciated everywhere for its convenience, cleanliness, low cost and reliability. During my management of the District Heating Company for 12 years, it happened only once that the supply to a few consumers had to be interrupted, owing to the flooding of the basements. The Fire Brigade isolated the section because of the escaping vapour from one basement due to the flood water vaporizing where in contact with the steam main. It would have been much worse if the old central heating boilers had been kept in service.

According to a report of the Association of Electricity Undertakings, there were in Germany in 1936, 28 district heating plants for public supply of heat. This figures does not include numerous central station heating plants for housing estates. The heat distribution systems were as follows:—

	Plants.
Steam	16
High pressure hot water	3
Low pressure hot water	3
Steam and hot water	6

In 1936, the total heat sent out amounted to 5.14×10^{12} B.Th.U.

Success in Germany

The success of district heating in Germany can be judged from the data published by a well known authority—Dr. Wellmann, *V.D.I., Journal*, Nov. 15, 1941, according to which new district heating plants for four towns were sanctioned and partly carried out for an annual supply of 30.5×10^{12} B.Th.U., about six times as much as from all pre-war plants.†

The development of district heating in the Soviet Union has been even more remarkable. It was started on a very small scale, with only two consumers, in Leningrad in 1924-25. In 1938 the total heat distribution system of Leningrad had already been extended to 44 miles, and the heat sent out in that year amounted to 3.3×10^{12} B.Th.U. At the beginning of 1939 the total capacity of generating sets with heat supply for space heating and process work in the U.S.S.R., amounted to 1,747,000 kW, and the total heat sent out in 1939 was 87.5×10^{12} B.Th.U.

According to the Five Years' Plan of 1938-42, which was interrupted by the war, the capacity of all thermal power stations had to be increased by 7 million kW, of which 5 million kW were to be installed with back-pressure or extraction turbines for heat supply. The heat-electric capacity would then have been 47.5% of the total steam driven electric generating capacity in the U.S.S.R.

In 1939, the total number of district heating plants in the U.S.S.R., including industrial plants with heat supplied to outside buildings, amounted to about 160. It is often said that the extent of these district heating plants is comparatively small. True, the length of the heat distribution systems and the number of consumers is very small indeed. According to the data on district heating for the ten leading cities* the total length of their heat distribution systems amounted to 136 miles, out of which about 120 miles were by means of hot water. The total number of consumers was only 1,063, although the number of connected buildings was much greater. This shows that the supply of heat is still limited to large buildings and factories.

District heating has also been adopted in other countries, such as Denmark, Holland, France and Czechoslovakia. The heat-electric station at Brno is of special interest, as it supplies steam to the majority of the textile and chemical factories of the town and to many buildings, for process work and heating. The Vatican City should also be mentioned as the only City on the Continent with a centralised heat supply throughout, and supplied from a heat-electric station.

Combined Heat and Power Generation

The rate of growth of district heating on the Continent in recent years has been much greater than in the U.S.A. It is due first of all to the fact that the cost of plant, especially of the heat transmission and distribution systems, and the cost of labour as well, are lower on the Continent and the cost of coal is higher than in the U.S.A. The main reason is, however, that American plants are operating as a rule with straight steam supply. In contrast to Continental practice, combined heat and power generation is seldom applied in the U.S.A.

The growth of district heating in the U.S.A. in the 'eighties and 'nineties of the last century coincided with the erection of numerous light and power stations which, at that time, were built with exhaust steam engines. It was a comparatively easy job to make use of the available exhaust steam for heating buildings in the neighbourhood of the power station. There was no need for returning the condensate, and the balancing of the heat and power loads was a simple matter. With the rapid growth of the electric power demand at the beginning of this century, the old primitive stations were hopelessly outpaced by large condensing stations. Such stations were located so as best to meet the requirements for cooling water and fuel delivery, and the comparatively small district heating plants had either to close down or to change over to live steam distribution. But even under favourable conditions, combined heat and power generation is not so efficient as on the Continent. This is due partly to steam distribution, but mainly to the poor load factor of the back-pressure electricity generating sets, and high operating costs.

In contrast, the development of district heating on the Continent has been based predominantly on combined heat and power generation. It started at a time when the superiority of large condensing sets was a well established fact. It had often to be started from the older power stations

* Paper to the Conference "Fuel and the Future" organized by the Ministry of Fuel and Power.

† The Growth of District Heating in Russia and Germany, by A. E. Margolis—Engineering, Oct. 8, 1943.

* District Heating in Russia, by A. E. Margolis. The Steam Engineer. February and March, 1941.

which were conveniently located in regard to the heat supply area, but had comparatively poor boiler plants and high working costs. Combined heat and power generation has not only the advantage of saving coal, but also of reducing considerably the cost of boiler plant, its attendance and maintenance, as compared with straight heat supply. Old power stations with high working costs which, from the standpoint of power generation would have to be scrapped, could again be run economically when used in addition for heat supply.

Development of District Heating in Hamburg

In Hamburg I started district heating from the oldest power station in October, 1921. In 1924, a second power station was given over to the District Heating Company. In 1929, all rights for district heating were acquired by the Electricity Company, and a third power station was put into service for heat supply. Finally, in 1933, the heat distribution system was connected to a comparatively modern power station located in Tiefstack outside the built up area of Hamburg, with a generating capacity of 85,000 kW., but with a working pressure of only 200 lb. per sq. in. Two new high pressure boilers of 220,000 lb. per hour, each with a working pressure of 1,700 lb. per sq. in., and two back-pressure sets of 11,000 kW, each exhausting at the pressure of the old boiler plant, were installed. The exhaust steam was transmitted over a distance of 2.2 miles to the third power station where it was used again for generation, and the exhaust steam of about 40 lb. per sq. in. was supplied to the network of the district heating plant. The existing back-pressure set was of 4,000 kW only but the generating capacity of the station could be increased to a total of 20,000 kW.

The steam main of 28-inch bore was designed for a transmission of 550,000 lb. of steam per hour at 200 lb. per sq. in. and 660° F. When transmitting 220,000 lb. per hour, a test showed that the drop in temperature was 54°, corresponding to only 22° F. at full load, and the loss of heat to less than 1% over a distance of 2.2 miles. It demonstrates the fact that heat can be supplied from stations outside a city, if the demand is sufficiently large.

It is noticeable how closely the development of district heating has been following that of electric power supply. After the erection of the Tiefstack power station, the older power stations were taken out of commission and converted into transformer stations. Similarly, after the erection of the steam main from the Tiefstack power station, the boiler plants of the two oldest power stations were taken out of commission and the power stations converted into sub-stations. The higher rate of growth of district heating is demonstrated by the fact that from the commencement of electricity generation in Hamburg, it took 35 years before a plant of the type to be seen at Tiefstack could be realized; wheres a comparable development in district heating has been accomplished in 12 years. During this period the annual heat supply rose from 36×10^9 B.Th.U. to 960×10^9 B.Th.U. It rose to $1{,}210 \times 10^9$ B.Th.U. in the year 1937-38 and, according to the latest information, to $1{,}600 \times 10^9$ B.Th.U. in the year 1941-42.

In Charlottenburg, district heating was started in 1926 from a modern power station with a boiler plant working at 500 lb. per sq. in. In Leipzig, Dresden, Barmen and Brno the new main power stations were erected for electricity and heat supply. In the Soviet Union this development took place on a much larger scale.

Heat Distribution

Most of the plants in Western Europe were built for steam distribution. This was due to the large number of steam central heating installations which could be easily connected to a steam distribution system. Hot water heating plants had to be connected by means of calorifiers. The heat supplied could be easily metered by means of condensate meters. In contrast with American practice, the condensate was always returned to the boiled plants to be used as feed water. With due precaution steel pipes can be used for the condensate and the danger of corrosion eliminated.

The disadvantage of steam distribution is the reduction in electric power output of the back-pressure sets and the high, almost prohibitive, cost of steam storage. A further disadvantage is the high cost of connexions for small heating installations.

From the standpoint of power generation, the low pressure hot water distribution system is the most efficient. The heating water replaces the cooling water of a condensing station, and the total latent heat of the steam is regained in the simplest way and at a very low back-pressure. The cost of a heat-electric station for low temperature heat distribution, when properly designed, does not exceed the cost of a condensing station. Low pressure hot water distribution is very suitable when all existing central heating systems are carried out by means of hot water.

The connexion of steam heating installations to a hot water distribution system is possible if the temperature of the circulating water is raised. This affects, however, the electric power output, and the increase in temperature of the water should for this reason be as low as possible. Moreover, this increases the quantity of circulating water, the size of mains and the cost of calorifiers.*

In Dresden a three-main hot water distribution system was installed in 1927-29. It consisted of two flow mains, one with a hot water temperature of 285° F., the other one with hot water at 260° F., and a common return main. All heating installations were connected by means of calorifiers, the steam heating systems using flow water of 285° F. and the water heating system flow water at 260° F. In later years a system of injecting high temperature flow water to the water of the heating systems was tried out and proved to be successful.

Hot water distribution with a flow water temperature of 275° F. and higher, and injection of flow water to the heating systems, was applied on a very large scale in the Soviet Union. Hot water distribution has been chosen for reasons of the increased electric power output, without giving sufficient consideration to the shortage of experienced engineers and skilled labour. According to the Russian literature it resulted in many unpleasant breakdowns. Under such labour conditions steam distribution systems have the great advantage that repairs can be carried out in a very short time, whereas, for the repair of hot water mains, much time is lost for drainage and refilling.

When heat distribution systems are placed in conduits and due regard is given to the welding and expansion of mains, temperature stress, venting and so on, the reliability of a district heating service is greater than that of any other service. The provision of conduits and of expansion protects the mains against any movement of the soil, and breakdowns as in the case of cold water or gas mains are actually excluded. All simplified methods, by burying the pipes direct in the ground, are done at the sacrifice of the reliability of service and should be applied with the utmost care.

Balancing of Heat and Power Loads

The co-ordination of heat and power generation depends upon balancing the variations of the heat and power loads, and a short review of the methods adopted should be of some interest.

Method (a).—By back-pressure and condensing sets working in parallel.—This is the most expensive method, because the capacity of the back-pressure sets is not available on mild days at the time of the electric peak, and the load factor of the back-pressure sets is comparatively poor. The cost of the back-pressure sets must, therefore, be allocated to district heating. This was the case in Hamburg when 2,000 and 4,000 kW. back-pressure sets were installed before heat storage was available.

* Superheated Hot Water from the Standpoint of District Heating, by A. E. Margolis. The Journal of the Institution of Heating and Ventilating Engineers, April, 1938.

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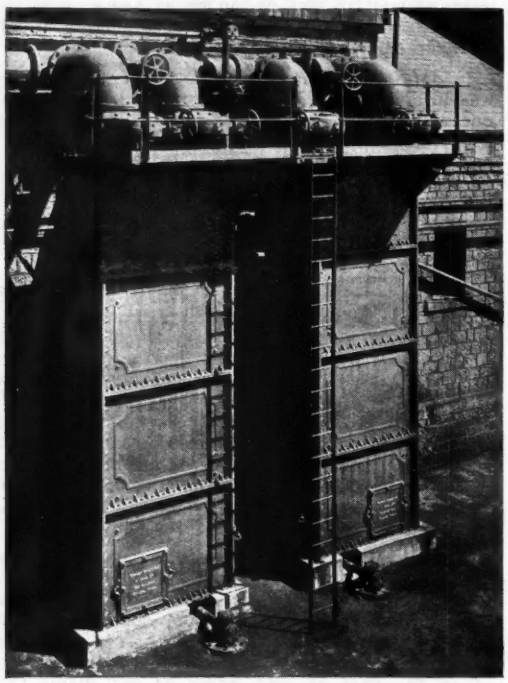

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Method (b). By back-pressure and low pressure condensing sets in series.—The exhaust steam of the back-pressure sets, when not required for heating, is supplied to a low pressure condensing set. This method was at first applied in Kiel in 1922-23, and later in Leipzig and Brno. It improves considerably the value and load factor of the back-pressure sets, and the additional cost of the low pressure condensing set is much lower than that of a parallel high pressure independent condensing set or sets.

Method (c). By the use of pass-out steam.—Pass-out turbines were extensively used in the Soviet Union. The cost of turbo-alternators is lower than that of separate condensing and back-pressure sets. The overall steam consumption, owing to the great variation of the heating load, is, however, much higher than with back-pressure sets. According to a report to the Academy of Science in the U.S.S.R. in 1943, the overall steam consumption was in many cases as high as for normal condensing sets without pass-out.*

Method (d). By hot water storage combined with any form of heat-electric station.—In the case of hot water distribution, heat storage in large capacity hot water accumulators is the most efficient method of balancing the variation of heat and power loads. Both services can be run independently of each other, and the back-pressure generating sets can be designed either for peak load or base load.

* The Principles of Operation and Design of Heatification, by L. A. Melentiev (in Russian). Proceedings of the Academy of Science in U.S.S.R., No. 3, 1943.

In Hamburg a hot water accumulator with a storage capacity of 400 × 10^6 B.Th.U. was installed in 1929-30, for the hot water distribution system. After that I could always run the back-pressure sets of 2,000 kW and 4,000 kW installed in two stations, situated at a distance of four miles from each other, in accordance with the requirements of the electric load. Any surplus exhaust steam or deficiency in heat was made good by the accumulator. The average heat losses of the Hamburg accumulator amounted to only 0.04% per hour.

Conclusion

District heating is the final stage in the development of central heating. Central heating is now generally adopted for Government and communal buildings, for factories, offices and the better class of dwellings. There cannot be any doubt that, with the steady improvement of living conditions, central heating will become as general as electric lighting, because it so greatly improves the comfort of living, because it gives an ideal and cheap service, and it has the additional advantage of eliminating most of the smoke nuisance and of saving very great quantities of coal. The development of district heating on the Continent shows that, by co-ordination of heat and power generation, it widens the economic basis of both heat and power supply. The increasing difficulties in mining and steady rise in the cost of coal makes this development a problem of paramount importance.

* An Outline District Heating Scheme for London, by A. E. Margolis, Engineering, March 26, 1944.

District Heating as a Public Service*

By A. STUBBS, B.Sc., M.I.Mech E.

DISTRICT Heating as a public service may be conveniently considered as the supply of heat for space heating and hot water in the form of a public utility service, comparable in scope with existing electricity, gas and water services. It may be provided for communities differing widely in size from housing estates to large cities. It is, however, to be regarded as distinct from the supply of heat to consumers or groups of consumers of one specific type, such as may be found in many large central heating schemes. For present purposes it is convenient also to disregard the supply of heat for manufacturing processes, which practice is already fairly well understood. The possibility of including process heat may be reserved for the particular example as being something supplementary which is going to add to the case for district heating in that instance.

A detailed study of an illustrative large district heating scheme has been made for the District Heating Sub-Committee of the Heating and Ventilation (Reconstruction) Committee of the Department of Scientific and Industrial Research, the Chairman of which is Sir Alfred Egerton. This scheme will be fully described in a comprehensive report on district heating being prepared by the Sub-Committee. In the meantime some of the figures relating to the scheme will be used in the following paragraphs by way of illustration. Any prices quoted relate to the year 1937, when the Board of Trade Index figure for intermediate products was around 100%.

One of the first things to establish is the thermal load characteristic of district heating, and since experience does not present suitable records it is necessary to examine the various types of heat load and the manner in which these are likely to be integrated so as to form a complete whole.

* A Paper to the Conference on "Fuel and the Future" organized by the Ministry of Fuel and Power.

There are three main types:—

(*a*) Industrial, and commercial buildings.
(*b*) Community buildings, including schools, hospitals, churches and the like.
(*c*) Housing, including flats.

The particular points of importance in relation to the thermal load curves are the maximum heat demand and the summated or average demand, although it is also of interest to know the load curve shape when estimating the plant which is to be reserved as standby, or when considering district heat generation in relation to another service such as electricity generation.

The heating loads of industrial and commercial buildings, as well as of community buildings, can be estimated from existing central heating experience, although the integration of the various loads does require special consideration. The heat load for small houses needs separate examination in view of its being a substantial part of the total load and because there is not experience available with this type of load when connected to a district heating service.

In the illustrative scheme already mentioned, houses considered collectively have been estimated to have an annual consumption per hour of:—

182 therms for hot water
393 therms for space heating
575 therms total

while the maximum demand per house has been estimated as:—

3,000 B.Th.U./hour for hot water
12,000 B.Th.U./hour for space heating
15,000 B.Th.U./hour total

In determining these figures it is considered that it would not be desirable to assume that the ordinary householder

would be prepared to pay more for space heating and domestic hot water supply from a district heating system than he does at the moment for heat obtained from burning solid fuel for the same purpose.

The solid fuel requirement per house for space heating and hot water may be taken as 4 tons per annum, which, at 60s. per ton, would be £12 per annum and would give 330 therms per annum effective heat.

The maximum demand of 12,000 B.Th.U. per hour represents the heat emitted from 75 sq. ft. of hot water radiator surface. For a normal two-storey house of 500 sq. ft. ground floor area this would be sufficient for continuous heating to 65° F. in the living room in severe weather, with a small amount of heating in the kitchen and upstairs.

It has been assumed that the district heating service would be suitable for the supply of heat to installations of normal design, using hot water as a heating medium at temperatures normally employed in this country. Also for the purpose of hot water supply a calorifier would be necessary.

Hot water may be chosen as the medium for distribution of district heat. This choice incidentally permits of a centralized control such that the heat supplied to houses would be in reasonable relation to requirements dictated by external weather conditions. This inherent feature of the system makes house metering unnecessary, which is a matter of practical advantage.

As already stated district heat may be supplied by a small community, a large town or city. An examination of the large scale application involves most of the problems of the small scale application. The build up of the complete load will in all cases depend upon the proportions of the various types of load.

The study of a typical town presented the following interesting figures:—

Area of town	25 square miles.
Population of town	250,000
Population served	60%
Developed area (acres):	
Industrial and commercial	1,355
Community	1,475
Housing	5,700
Total	8,530
Maximum demand therms/hour:	
Industrial and commercial buildings	7,680
Community buildings	2,440
Housing	6,180
Total	16,300
Load factor:	
Industry and commercial	20.4
Community	20.0
Housing	43.7
Overall	29.3

Interest in the housing load is increased because of the relatively high load factor.

Large scale applications approaching full development, may be expected to have the same features as are found with other services, such as electricity supply—viz., central generation, the main distribution and the sub-distribution.

The main and sub-distribution will be by pipe systems installed underground, the pipes being suitably insulated and protected. In the generating station and the sub-stations pumps will be operated to deal with the heat conveying medium.

In the case of the typical town with 60% development, the total electrical energy absorbed by the pumps is 35.4×10^6 kW hour, per annum. The heat losses per annum are:—

Sub-distribution system	5.366×10^6 therms.
Main distribution system	3.184×10^6 therms.

which total heat losses correspond to 17.3% of the total heat sent out from the generating station.

Heat required for district heating is relatively low grade, much lower grade, in fact, than that which may be used in the ordinary power generation cycle. This remark is applied to the steam turbine cycle, but it would also apply to the Diesel cycle and the gas turbine cycle.

The heat for district heating may be generated most simply direct in a boiler plant; the steam generated being used in calorifiers to transfer the heat to the transmitting medium. In many small schemes this may well be the practice adopted and even in the larger schemes a considerable proportion of the heat would be dealt with in this manner through peak heaters, but there is still a large proportion of heat which may be generated under conditions which involve a compromise between the straight heat cycle and the power cycle.

The study of this compromise leads to the thermal electric station. The study is complex for it involves not only the thermo-dynamic features and the apportionment of the heat costs between district heat and power, but also the proper use of the capital invested and the apportionment of the capital charges in a similar manner.

The net result, in the case of the typical town with its 60% development, is to reduce the cost per therm to the consumer by approximately 20% when heat is generated at a combined thermal electric station, as compared with the cost of heat generated at a straight heat station.

The cost of heat supply for the typical town with 60% development, and with the generation at a combined thermal electric station, is shown in the following figures:—

Consumers' maximum demand—16,288 therms/hour.
Annual fixed costs—£39.5 per therm/hour maximum demand.
Annual consumption at consumers—41.81×10^6 therms.
Running costs—0.93d. per therm.
Overall cost per therm at consumers—4.62d.
This overall cost is distributed as

Generation	1.44d.	per therm.
Main distribution	1.18d.	„ „
Sub-distribution	2.00d.	„ „
Total	4.62d.	„ „

An examination of the distribution of costs between the various types of load seemed to indicate that it would be reasonable to regard the total average of 4.62d. per therm as applicable to the housing load. This somewhat unexpected result arises from the high load factor of the housing load which serves to offset the greater spread of the housing load, which, by itself, increases the distribution costs.

The fuel economy to be obtained by the use of a district heat service to the typical town in its 60% developed stage is shown by the following figures:—

Total annual coal consumption allocated to the supply of heat—145,000 tons.

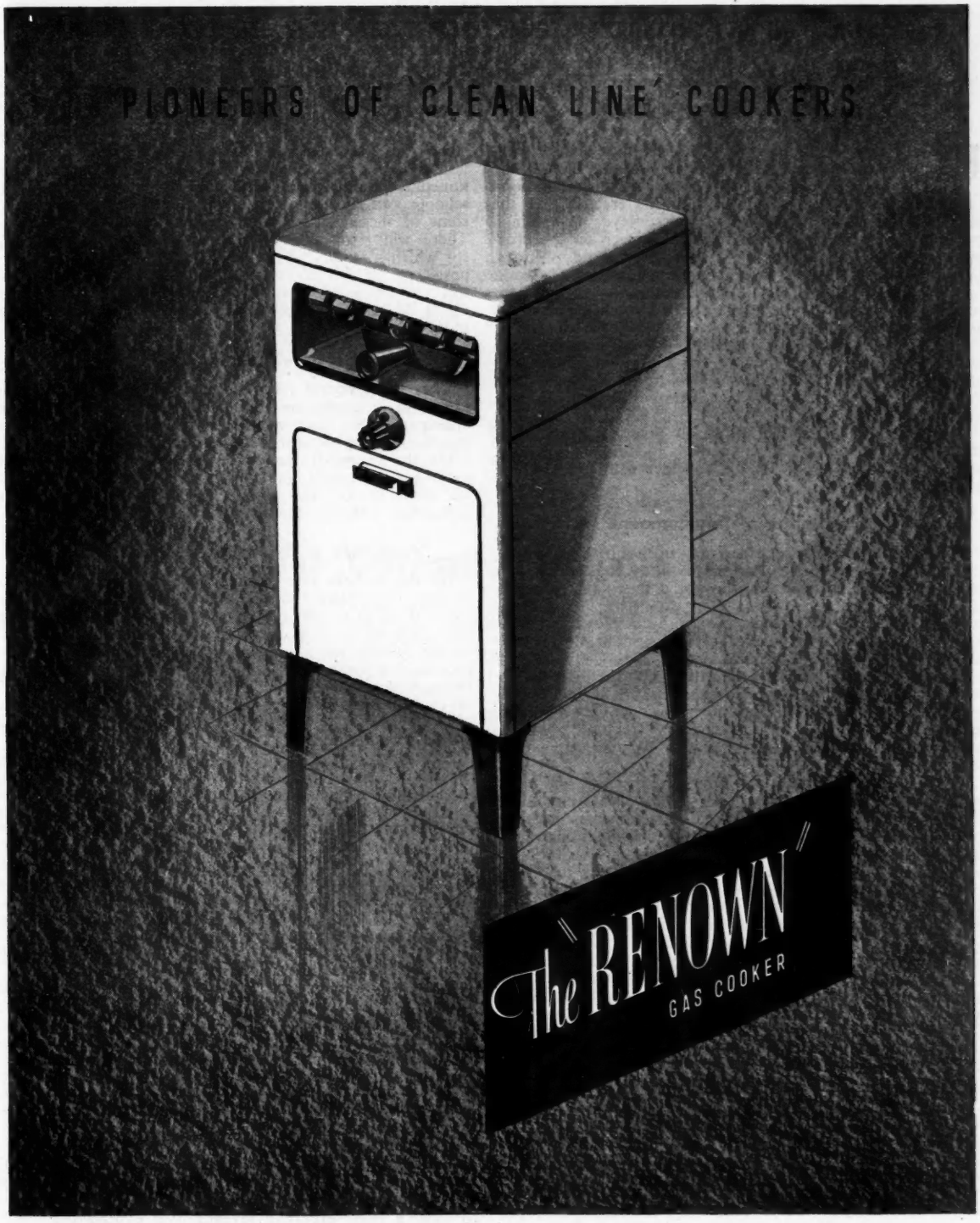
The corresponding fuel consumption with existing practice would be:—

	tons/annum.
41,385 houses served at 4 tons per house	= 165,000
Industrial, commercial and community	= 112,000
Total	277,000

Giving a total annual saving of 132,000 tons/annum.

District heating offers the prospect of a very large saving in fuel. For every million people who receive the service there is the prospect of a saving in coal of 0.8×10^6 tons per annum. The advancement of the art of power generation is not likely to remove this potential saving, for district heat generation may be coupled with the most advanced power generation contemplated at least for some years to come.

The Publicity Club of London held a very pleasant lunch at the Waldorf Hotel on Dec. 19, under the Chairmanship of Mr. W. R. Balch, Publicity Manager of *The Times*. The toast of the occasion was "The Trade Journals," responded to by Mr. A. Heighway, Editor of *World's Press News*. The guest of honour was Commander Campbell, who gave a racy and amusing speech which made an excellent finish to a very successful gathering.



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Proposed District Heating Scheme at Urmston*

By E. L. LEEMING, M.Sc.(Tech.), M.Inst.C.E.

Engineer and Surveyor to the Urmston Urban District Council

EARLY in 1945 the Urmston Council proceeded to negotiate for the acquisition of a large estate at Flixton, the layout for which showed that within the neighbourhood unit some 1,300 new dwellings could be erected. At the same time the Council authorized the surveyor to obtain a preliminary report from a consulting engineer on the prospects of district heating for the whole of the estate. Messrs. Donald Smith & Partners were invited to undertake this work.

The interest of the Council in district heating arose from several considerations; there was the need for fuel economy and the opportunity to put into practice smoke abatement —a subject in which the Council has always shown a deep interest; it was resolved, therefore, to explore all possibilities of smokeless heating and, if practicable, to improve or replace the inefficient old-fashioned open fires in connexion with the new Flixton Estate.

The report indicated that it was a practical proposition, and the matter was further pursued and discussions took place at the Ministry of Health, together with the Ministry of Fuel and Power.

Description of Development

The whole estate has been designed in groups of dwellings around squares or open spaces of about 1½ to 2 acres with varying types of houses, bungalows and flats; the grouping of the dwellings has assisted to some extent the layout of an easy control of the proposed district heating system. The buildings proposed to be served by the district heating system comprise 763 houses, 224 maisonettes, 222 flats, and 108 bungalows for aged people, a total of 1,317 dwellings; community centre, health centre, shopping centre, cinema, hotel, creche, restaurant, service flats, nursery school, two infants schools, two junior schools, secondary school, pavilion, laundry, library, miscellaneous premises—*e.g.*, garages, greenhouses, &c.

It is proposed to supply heat for all rooms, and hot water for domestic purposes from one central heating station. Mains will be laid in the different directions to give the required supply to the estate, including public buildings such as schools and others mentioned in the above schedule.

One open fireplace is being left in each house in the living room and it is anticipated that a small gas or electric unit placed there will be sufficient for topping up heat in the coldest part of the winter. Hot water radiators will be fitted in each bedroom, kitchen and living room; the bathroom towel rail is also heated. For this service there will be a separate closed circuit which will circulate water at about 105°-110° F. The room temperatures will vary from 58° F. in the working kitchen to 62° F. in the living rooms and 52-54° F. in the bedrooms and hall. These temperatures will apply when the external atmospheric temperature is 32° F. The domestic hot water supply will be circulated in copper pipes at a minimum temperature of 130-140° F.

Consumption of Domestic Hot Water

It is difficult to say what the average consumption of domestic hot water per day would be, but the following table is regarded as a fair estimate:—

Consumption per day per House.	No. in Family.	No. of Bedrooms.
(*a*) 40 gall.	5-7	3-4
(*b*) 35 gall.	4-5	2-3
(*c*) 30 gall.	2-3	1-2

Controls will be provided so that the supply to each house, as well as to the individual radiators, can be regulated or isolated. This will enable repairs to be made without affecting the working of the general system.

The inclusion of public buildings in the scheme makes possible a more economic price for the supply to the houses. This is on the principle that the greater the turnover the less per head are the overhead charges. As already mentioned it is anticipated that there will be two new primary schools and one secondary school within the scheme, and some of these will no doubt require heat at an early date. There will also be shop premises and flats on the estate for which a supply of heat will be advantageous. It is proposed to build a community centre and it is possible that this may have a small swimming pool which it is hoped might be run on an economic basis even during the winter months.

Miscellaneous Buildings

The layout provides for the erection of blocks of garages to be let in connexion with the house tenancies, and it is anticipated that heat can be supplied during the winter months to these garages at a modest annual or weekly charge.

On the fringe of the developed area provision has been made for allotments and small holdings; heat will, therefore, be available for heating greenhouses and other buildings concerned with this aspect of food production.

Possibility of Extension to Existing Houses

On the easterly side of the estate there is a considerable number of modern houses, built to a density of not more than 10 or 12 to the acre, where it is anticipated there will be a demand for the district heating service. The capacity of the scheme, therefore, should allow sufficient margin to meet such a demand and, no doubt, special rates would have to be arranged in the first instance according to the number of consumers in a particular area. Already enquiries have been received as to the prospects of connecting these existing houses to the service.

It is clear that with a new estate it will be necessary to supply hot water to the first houses to be completed, and it may not be economic, or even practicable, to provide the final heating station and equipment until a later stage of the development. It is proposed, therefore, to put down a temporary boiler plant to serve the first 200 houses. It may be necessary, however, to give a supply even to a smaller number of houses which it is expected will be completed before the winter of 1946-7. It is proposed, therefore, to instal a small heating unit within one of the buildings; the building will serve later as a block of garages for the estate. It is of the highest importance that the occupants of the estate should be given this service from the outset.

The cost per house will vary according to size—*i.e.*, the number of bedrooms, floor area, &c. When the scheme is finally completed the average cost per house for loan repayment and running costs will be approximately 4s. 6d. per week, excluding topping up heat in very cold weather. In all schemes of this kind one does not expect that, in the first six months, the first few houses will be running on an economic basis, and it may be found expedient to have a slightly higher charge in the initial period of the scheme. Much will depend upon the speed at which the estate is completed and the public buildings brought into use. At the present rate the whole of the estate should be fully developed within 3-4 years, by which time the charge would be stabilized to show a slight excess of revenue over expenditure.

Economic Advantages of District Heating

We have all seen the advantages of the "Pay as you earn" method of collecting income tax and the advantages of collecting rent and rates weekly. In the case of district heating the weekly charge will be collected along with the rent so that the cost of collection is negligible.

The social and economic importance of collecting the fuel costs as a flat weekly rate all the year round cannot be too strongly emphasized. In normal times people bought most of their coal in the winter; to-day they are compelled to

* Paper to the Conference "Fuel and the Future" organized by the Ministry of Fuel and Power.

acquire some stocks in the summer as well in order to carry through the winter.

It would appear that the average householder at Urmston pays 9s. 6d. per week for solid fuel in the six winter months and 5s. 6d. per week for the six summer months—an average of 7s. 6d. per week all the year round. Compare this with the estimated price for district heating at 4s. 6d. per week as a steady charge, winter and summer; the additional cost of "topping up" heat with one gas or electric fire in the coldest part of the winter should not exceed an annual average cost of about 9d. per week. We must remember too that "topping up" heat is needed in a house heated by the open coal fire.

Since the weekly charge of 4s. 6d. includes loan repayment on the capital cost at an interest rate of 3⅛%, the recent reduction of interest rates from 3⅛ to 2½% will mean a corresponding reduction in the weekly charge. This task of making the scheme self-supporting is made much easier than would appear to be the case with the higher rates of interest prevailing before the war. It should be mentioned here that the Consultant to the Council has insisted throughout that the scheme must pay its way and the service will be provided only on this basis. It is estimated that the installation of a district heating service will mean a saving of from one to two tons of coal per house per annum as compared with the conventional methods of burning raw fuel.

The Advantages of the Scheme

(1) Smoke Abatement.—Smoke will be eliminated, and as the site lies to the west of the town, from which quarter the prevailing winds blow, the advantage to the developed areas will be obvious.

(2) Fuel Economy.—Fuel will be burnt with a much greater efficiency in the central station than it could be in open fires; low grades of fuel may be used.

(3) Reduction of Local Traffic.—Domestic deliveries and storage of fuel will be eliminated and refuse collection will be reduced to a minimum.

(4) Domestic Labour Saving.—Cleaner and easier conditions will be created in the home for the housewife, and a dry and warm atmosphere in all rooms will be available at all times of the day and night.

(5) Economy in Housing Maintenance.—Plumbing costs in the winter, due to frozen pipes, will be largely eliminated. The cost of interior decoration will also be reduced.

(6) Financial Benefit to Tenants.—The scheme will give greater heat at less cost and will assist tenants in their weekly budget by way of a flat charge which will be collected with the rent throughout the year.

Coal Utilization Research

In his Presidential Address to the British Coal Utilization Research Association on Dec. 12, Mr. Robert W. Foot said it was because the Mining Association had set so much importance on the co-operative factor that they had regarded research into coal utilization as being essential to the producing industry. During the eight years of B.C.U.R.A.'s existence the Mining Association had contributed well over half a million pounds to the Association. It had always been the hope and the wish of the Mining Association that on the vesting date for the nationalization of the mining industry the National Coal Board would step into the Mining Association's shoes as regards the latter's relations with B.C.U.R.A. That had also been his own strong personal wish, and he had been much encouraged by the various statements made from time to time by the Minister of Fuel and Power and by Lord Hyndley, Chairman of the National Coal Board, on the importance which the Government and the Board attached to research in connexion with the utilisation of coal.

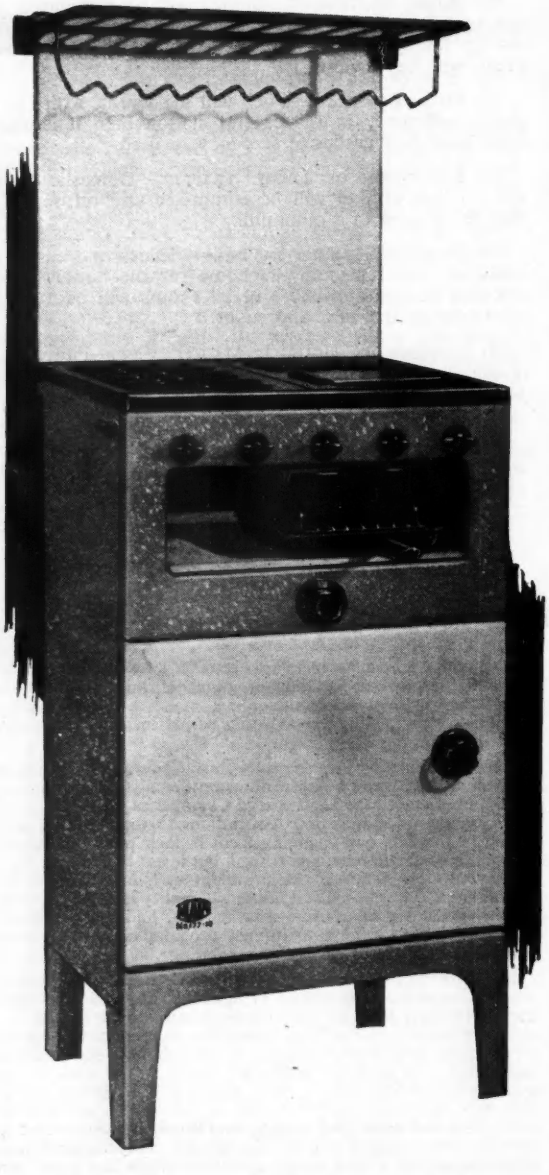
It was therefore with the greatest pleasure that he was able to announce that the National Coal Board had accepted the principle that as from Jan. 1, 1947, the Board would step into the shoes of the Mining Association in its relations with B.C.U.R.A. He was convinced that this was a wise decision, and one which must prove to the great and lasting advantage not only of B.C.U.R.A. itself but of the coal industry and of the nation which that industry existed to serve. It would emphasize once more the importance attached to coal utilization research and would be a factor in encouraging, expanding and co-ordinating that research. It was in the hope of such a satisfactory development that the Mining Association determined, when the proposals for the transfer of the industry to public ownership were first announced, to maintain its support for B.C.U.R.A. both financial and other, on the existing scale, until the vesting date without any modification or reservation in order that the Research Association might be handed over as a going concern with an enthusiastic staff which had not suffered anxiety or the disappointment caused by the interruption of the important work upon which it was engaged.

The future work of the Association was, of course, largely dependent on the progress of the building work at Leatherhead where they were erecting laboratory, engineering, and administration buildings on a site adjacent to the British Electrical and Allied Industries Research Association, the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery, and Jam Trades Research Association, and the Printing and Allied Trades Research Association. The fact that priority had of necessity to be given to housing programmes had delayed the completion of building work at Leatherhead, and they had had to make drastic alterations to their plans in order to fit in with the Government's building policy. They were, however, already in occupation of the Combustion Research Building, where development work on the down-jet furnace was proceeding, as well as the fundamental investigations on Shell boilers and the work of the domestic appliances department. A further building, which was completed last summer, was occupied by the engineering workshop and the drawing office. They were hoping that the Ministry of Works prefabricated huts which were being erected to house the laboratories and administrative staff, would all be ready for occupation by next autumn, and that the remainder of the building programme, which included the coal stores, the sample preparation building, the stores and services building, and the central heating plant, would be put in hand during the early part of 1947.

They were making arrangements to share certain common services with the other Research Associations on the adjacent ground, and the local authority and the Leatherhead Chamber of Trade had welcomed this community of Research Associations to their district, and were giving all the help and encouragement in their power. The problem of housing staff still remained critical, but it was hoped that this would improve as time went on. Meanwhile, they had arranged to house a limited number of people at a house which they had bought at Pebblecombe, some six miles from Leatherhead, and when the scientific staff was able to move into its new accommodation they would be able to increase the living space available.

Mr. Foot paid tribute to the help which B.C.U.R.A. had always received from the Department of Scientific and Industrial Research and particularly from Sir Edward Appleton and Mr. Oakley. They and their Department had been prompt and unfailing not only in offering co-operation and every assistance in their power, but in translating such offers into deeds of a practical nature. The staff, which now numbered over 300, ranged from scientists and research workers of first class qualifications and scientific attainments to junior laboratory attendants and shorthand typists, and he was satisfied that having survived successfully the difficulties of their early beginnings and in particular all the difficulties of operation which had to be met and overcome during the years of the war, they had now been welded together as a first class team of loyal and efficient workers. Dr. D. T. A. Townend, who had been a Director of the Association since Oct. 1, 1945, brought to his work a highly trained scientific mind and unbounded energy and enthusiasm, and under his leadership and inspiration the Association now had a staff which was fit in every way to face with confidence the future and the difficult and important work which lay ahead.

Perth Gas Department is showing some uneasiness at the steady rise in consumption in the town and the plant may be called upon to help Newburgh and Abernethy. Extensive new plant is being installed at Perth, and while negotiations have been opened for a supply to Newburgh and Abernethy the position is indefinite owing to nationalization plans. Perth Council has appointed a committee to discuss with Abernethy Town Council, Abernethy Gas Company, and the Ministry of Fuel and Power the question of taking over Abernethy supply. The action has followed complaints about local supply. Newburgh was recently called the gasless town, but the position at Abernethy is almost as bad. Almost daily the supply is cut off during the day in order to conserve it for lighting at night. Perth Housing Committee has agreed to co-operate with the Gas Committee in the erection of houses for gas-works employees. The proposal is to erect houses near the works for the convenience of shift workers.



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News in Brief

Stockton-on-Tees Town Council has applied to the Ministry of Fuel and Power for sanction to increase the price of gas by 0.84d. per therm.

Kirkcaldy Corporation has decided to fix either gas or electric cookers in the new housing schemes. Consumers can have the option of either type. Of the first 28 houses completed, 26 have, at the consumers' request, been fitted with gas cookers.

Tenders Have Been Accepted by Stockton-on-Tees Town Council for improving the gas supplies in the Billingham and Haverton Hill area. About four miles of pipes are needed. The tenders of Cochranes, Ltd., Middlesbrough, has been accepted for the pipes ; of Peebles & Co., Edinburgh, for six governors ; and Tarslag, Ltd., for the laying of the mains.,

Presentations Were Made at the Chelsea works of George Glover & Co., Ltd., on Dec. 13 by Mr. W. D. King, Director, to two of their workmen, Mr. A. K. Fraser and Mr. E. H. Walker, on completion of 50 years' unbroken service with the Company. Since 1896 Messrs. Fraser and Walker have been engaged in the manufacture and assembly of Ranelagh prepayment movements.

Leven Town Council has been told by Mr. Lindsay Burns, Managing Director of Henry Balfour & Co., Ltd., Gas Engineers, Leven, that the town could become one of the leading chemical engineering centres in Great Britain if it could make an immediate allocation of houses for key men required by the firm. "We employ 1,200 men now," he said, "but we ought to have 2,000 men at least on our payroll. I know it is ridiculous to expect that you can offer houses to that extent in these times, but even if we could attract 100 men it would be of considerable help. Our immediate, urgent need is for half-a-dozen houses for key men."

While There Have Been No Cuts in the pressure of gas supplies in Edinburgh so far, complaints have been made by a number of housewives in connexion with their supplies for cooking and baking, and it is thought that these may arise from faulty domestic apparatus. During the war, in order to save coal, a progressive reduction was made in the calorific value of the gas and this has not been restored, but its effects are not considered to have been sufficient to be noticeable in the household kitchen. An official of Edinburgh Gas Department said that the position had been "reasonably comfortable up to the present" and they had not had to do anything drastic. The coal situation had not yet seriously embarrassed them, though they were living from hand to mouth in that respect.

Droitwich Town Council was informed at its last meeting by the Chairman of the Gas Committee (Mr. W. G. Taylor), that he hoped the Worcester New Gas Light Company would be supplying gas to the borough in six months' time. The Company is purchasing the Droitwich undertaking and has agreed to extend its mains from Fernhill Heath to Droitwich before the final transfer comes into effect. Mr. Taylor said the only thing that could cause delay was the shortage of labour and materials. The Worcester Company had guaranteed the position of the employees now engaged at the Droitwich works. The Accountant (Mr. P. G. Stembridge) reported that the financial position of the Droitwich undertaking had deteriorated to the extent of £3,030 in the period March to September, and the bank overdraft now stood at £10,847. In view of this alarming state of affairs, it was most essential that the Worcester main should be extended as soon as possible. Mr. Taylor said the Ministry of Fuel and Power had at last sanctioned an increase in the charges for gas, and the Council referred this matter to the Finance Committee. The price which the Worcester Company is paying is still not disclosed, but when the sale was announced some months ago, Mr. Taylor said that Droitwich consumers would benefit from a considerable reduction in charges.

Kirkcaldy Gas Department is running an interesting series of fortnightly lectures for gas fitters and distribution personnel in its own Department, and also those who care to attend from neighbouring undertakings. These evening lectures are held in the showrooms, and the syllabus covers a comprehensive range of gas appliances, and their maintenance. Local plumbers have also shown interest in the scheme, and have been invited to attend, particularly with regard to the maintenance of water heaters. An informal discussion takes place after each lecture, and tea is also served. In conjunction with this scheme, it has been arranged to send a number of fitters, from time to time, to a gas meter firm in Edinburgh to gain first hand information on the construction and the working of a gas meter. The following programme of lectures has been arranged: Jan. 14, "Gas Fires and Their Maintenance," Radiation, Ltd.; Feb. 3, "Central Heating—Maintenance Points," Glasgow Gas Department; Feb. 17, "Refrigerators and their Maintenance," Electrolux, Ltd.; Mar. 3, "Gas Meters and their Functions," Thos. Glover & Co., Ltd. Judging by the attendance, and the lively interest shown in these lectures, Kirkcaldy Gas Department's enterprise is going to be rewarded, and the consumers will benefit by having their gas appliances properly serviced to give maximum efficiency.

The Address of Mrs. M. Pleydell-Bouverie, Organizing Secretary of the House Building Industries Standing Committee, is now 4, Manchester Square, London, W.1 (Telephone: Welbeck 1356).

The Staff of the Blackpool Department held a whist drive and dance at the Pelham Mount Club, Blackpool, on Dec. 12. The function was well patronized and amongst those present were Councillor S. Morris (Chairman of the Gas Committee), and Mrs. Tomlinson (widow of a former Chairman), who presented the prizes.

Mr. A. H. Nicholson, Engineer and Manager of Colne Gas Department, reports that in the year ended Mar. 31 there was a net profit of £1,782. Assets were valued at £232,586. Gas sent out during the year broke all records, exceeding 300,000,000 cu.ft. Mr. Nicholson adds that last March, Colne assisted Nelson by supplying over 2,000,000 cu.ft. to the neighbouring authority.

Following Negotiations with Gateshead Corporation, Newcastle-on-Tyne and Gateshead Gas Company has agreed to accept £4,500 for street lighting charges. A report submitted to Gateshead Council stated that the Company originally claimed £6,060 and afterwards this had been reduced to £5,177. The Company had now agreed to accept £4,500 and the Council agreed to accept the offer.

The British Employers' Confederation and the Federation of British Industries have agreed in principle to the two organizations being merged into one body with one Council and President, and staff, and a scheme of amalgamation is to be prepared for submission to the members of the two organizations. Owing to the wide difference in the structure of the two bodies, the working out of a scheme satisfactory to both will inevitably take some time, but the decision now taken in principle will allow that work to proceed. Hitherto the Confederation has dealt with labour questions and the Federation of British Industries has dealt with commercial and economic questions

The Gas Supply at Newport (Fife) is likely to be provided soon by Dundee. The Dundee Gas Committee has approved in principle a request from Newport Town Council to sell them gas in bulk for distribution on the other side of the river. The Newport Council has had under consideration the gas supply from the Newport works. Owing to increase in price of coal, wages, and other labour conditions, cost has increased greatly and the Ministry of Fuel and Power did not look with favour at any extensive capital expenditure. Mr. James Dickson, Engineer and Manager, reported to the Dundee Gas Committee that he thought the proper basic price should be the same as Dundee was giving to its industrial consumers, plus any small additional charge the Committee might think should be imposed on a municipality not ratepayers of the city. Replying to questions, Mr. Dickson said Dundee was the only possible distribution centre in the area. Tayport and Newport were on the opposite side of the river and that was why he suggested a 9 in. supply main. Negotiations were left with the Convenor and officials. The proposed charge to Newport will vary from a maximum of 4s. 4d. down to 3s. 3d. per 1,000 cu.ft. The present price in Newport is 6s. 6d. If negotiations are concluded quickly, it is thought Dundee can begin supply for next winter.

Blackpool Corporation recently held a Local Government Exhibition, designed to illustrate to the public the work and progress of the various municipal departments during the past year. Our photograph shows the Gas Department's contribution to the display.

D

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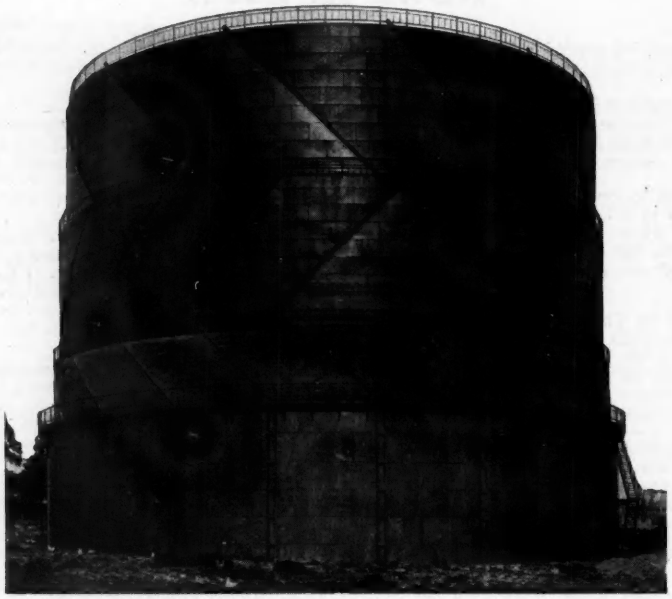

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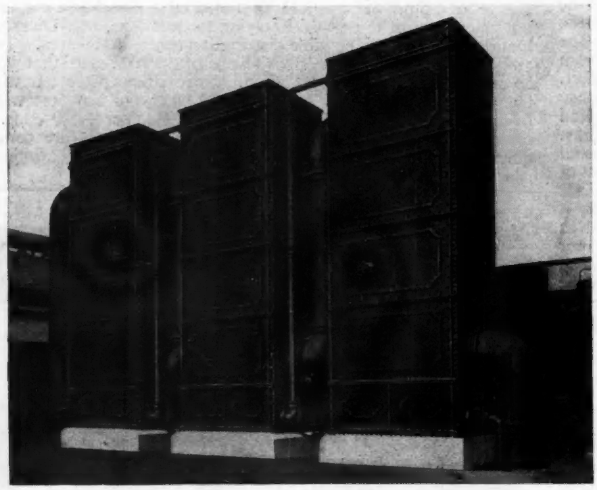

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A Century of Gas

Middleton Gas Department reports an increase of 7.9% in gas sales for the past financial year, the total being 294,822,000 cu.ft. Gross profit at £9,591, was £3,627 below that for the previous year, and the net profit was £2,316, a reduction of £477. Mr. H. D. Robinson, Engineer and Manager, in his annual report, states that the Gas Committee has approved a three-year capital expenditure programme to increase the capacity of the gas manufacturing plant to two million cu.ft. per day. Although further increased costs in coal and wages are anticipated, it is hoped that the price of gas, which is one of the lowest in the country, will be maintained at its present figure.

With the annual report, the Gas Committee issued a reprint of an article by Councillor H. Norcross, published in the local Press, recounting the history of the undertaking, which attained its centenary last May. Founded by a company, the undertaking was acquired by the Middleton and Tonge Improvement Commissioners in 1861, the Commissioners being superseded by the Town Council some years later.

Sheffield's Projection Theatre

There is no doubt that films are destined to play an increasing part in the future commercial and technical activities of the Gas Industry The opportunities afforded by films as a medium for widening the scope of educational publicity, visual propaganda, and sales promotion are unlimited.

Realizing the importance of the part that films are destined to play in the new era of public relations and in the development of all phases of commercial and technical activity, Mr. Ralph Halkett, General Manager and Chief Engineer of the Sheffield and District Gas Company, made early plans to establish a projection theatre with the object of providing a focal point to meet the demand of the modern trend.

Situated in the central office of the Company at Commercial Street, Sheffield, the projection theatre has been designed along the lines of a super-cinema in miniature, equipped for 16 mil. sound and silent films. The theatre will accommodate audiences of 50 people. A feature of the decorative scheme is a mural in colour depicting the clean-cut lines of a modern gas-works. Two alcoves have been provided for the presentation of gas appliances and display features.

Interior of the New Projection Theatre

Warmth, cosiness, and the personal comfort of the audiences has been the keynote, walls have been treated in a warm shade of orange graduating to deep cream on the ceiling, and in contrast doors and curtains are in maroon.

It is intended to develop the use of the theatre along the widest possible lines in co-operation with local manufacturers, engineers and technical men; also with the local schools in conjunction with the Sheffield Education Committee.

It has also been felt for some time past that consumers who have their own organizations connected with churches, &c., would appreciate accommodation of this kind where they could see topical and interesting films of their own choosing, and contact has already been made with women's institutions with a view to arranging programmes for them.

The question of staff training has not been overlooked, and it is hoped regularly to include films in the syllabus of both commercial and technical trainees. Messrs. Stewarts & Lloyds, Ltd., showed their new sound film " Pluto—Pipe Lines Under the Ocean " to the executive staff of the Gas Company in the cinema on Dec. 12.

Chemical Engineering at the University of Leeds

Following the institution of degree courses in Chemical Engineering by the University of Leeds in 1942, the Department of Coal Gas and Fuel Industries has been acquiring additional items of chemical plant to equip a special laboratory for the study of unit operations. Despite the difficulties imposed by the war and post-war periods, equipment covering most of the principal chemical engineering operations has now been obtained.

The units are sufficiently large to ensure a performance and technique of operation similar to that of commercial plant, and in addition are provided with a full range of measuring instruments. Installations include a double-effect evaporator, still and fractionating column, rocking crystallizer, centrifuge, filter press and rotary vacuum filter, jacketted pan, heat interchanger, tray drier, double-drum film drier, kneading type mixer, and a super-centrifuge. Extreme congestion has necessitated housing some of the equipment in out-buildings, but most of it is accommodated in an annexe to the main building which has been named the Charles Brotherton Chemical Engineering Laboratory. The present location is temporary, and when conditions permit the whole of the equipment will be transferred to an adequate and permanent building.

On Dec. 12 the Second Brotherton Lecture of the Society of Chemical Industry was delivered in Leeds by Dr. D.T. A. Townend, and the opportunity was taken of arranging for the temporary Chemical Engineering Laboratory to be formally opened prior to the Brotherton Lecture.

Members of the Gas, Coking, and Chemical Industries were present. Unfortunately Mr. G. C. Pearson, President of the Institution of Gas Engineers, Mr. Ralph Alsop, Chairman of Council, British Coke Research Association, and Mr. Hugh Griffiths, President of the Institution of Chemical Engineers, were prevented from attendance.

Over 100 visitors assembled in the Chemistry Lecture Theatre of the University to hear the Vice-Chancellor (Mr. B. Mouat Jones) pay tribute to the many friends represented at the gathering whose generosity had made possible the implementation of the schemes for Chemical Engineering training. Once again the University was indebted to Mr. Charles Brotherton and Messrs. Brotherton & Co., who had provided £55,000 towards the cost of a new building when this became possible, as well as gifts for chemical engineering equipment and endowments to provide staff. The Department had also received most generous and continued support for general equipment from the Gas Industry, through the Joint Standing Finance Committee of the Institution of Gas Engineers, the National Gas Council, and the British Commercial Gas Association. He also expressed thanks to the many industrial firms for financial support or for equipment provided either gratis or under most favourable terms.

Dr. D. T. A. Townend (Director, British Coal Utilization Research Association, and formerly Livesey Professor) then gave a brief history of the Department. He paid tribute to the foresight of the late Professor W. A. Bone, who established courses of training on such a broad basis that they were, in effect, largely Chemical Engineering. Any doubts there might have been about the need for chemical engineers were now completely resolved by the great and growing demand for such men and, consequently, for their training. For completion, the Leeds courses had needed more facilities for the study of unit operations; now that these were available, although the plant was most inadequately housed, they could offer with confidence a full and balanced course in the subject.

Visitors then proceeded to the Department of Coal Gas and Fuel Industries, where the brief formal ceremony of opening the Laboratory was performed by Mr. George Brotherton-Ratcliffe, in the unavoidable absence of Mr. Charles F. R. Brotherton. A brief tour of inspection of the Chemical Engineering Laboratory and the Department as a whole followed.

Middlesbrough Corporation has accepted the tender of West's Gas Improvement Co., Ltd., Manchester, for the erection of a new carbonizing plant at Middlesbrough gas-works. Plans for the new plant have been prepared by Mr. J. W. Pallister, Engineer and Manager.

Tenders are to be Obtained by Middlesbrough Corporation for a new gasholder at Stokesley. The Corporation's area of supply was extended to include Stokesley in 1939 and since then the sale of gas in that area has increased 250%. The revenue has been sufficient to pay for a new mains, and meet interest and redemption charges on the purchase of the undertaking of the Stokesley Gas Company, and there is a substantial margin of profit.

Hartlepool Gas and Water Company, which celebrated its centenary this year, has issued a brochure referring to the nationalization plan for the Gas Industry. The brochure stated that nationalization would tend to destroy the local outlook and parochialism of individual undertakings. Whatever the future held, the undertakings would continue to serve as best they could the communities which looked to them for essential services. The first gas-works built in the Hartlepools was erected by James Atkinson West in 1836.

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Books Received

The story of the house of R. and J. Dick, Ltd., Glasgow and branches, from the early experiments carried out by the brothers Robert and James Dick to the present widespread activities of the Company, is told in 100 *Years of Guttapercha*, compiled by Thomas Chalmers, and dedicated to the memory of "two great Scots gentlemen, distinguished alike by their business ability and humanitarianism." Their early days were marked by failures as well as successes, and at the end of their lives they left the gift of R. and J. Dick, lock, stock, and barrel, to their senior employees. For six years the 14 co-partners carried on the firm, the Company being formed in 1908, since when there have been three Managing Directors: Mr. J. E. Audsley, who retired in 1913; Mr. A. C. Hay, who died in 1936; and Mr. A. K. Aitken.

* * *

The *Yearbook of the British Standards Institution*, which has just been published, gives a subject index and a synopsis of each of the 1,300 British Standards now current. These standards have been prepared by representative committees of 44 different industries. The *Yearbook* includes lists of members of the General Council of the Divisional Councils and of the Industry Committees of the Institution as well as other useful information about its work. The *Yearbook*, price 2s. post free, can be obtained from the Publications Sales Department, British Standards Institution, 28, Victoria Street, London, S.W.1.

* * *

The Association of British Chemical Manufacturers has issued the 1946 edition of *British Chemicals and their Manufacturers*. During the war years the Association was not permitted by Government regulations to publish any new editions, and consequently this is the first revision of the Directory since 1939. The new issue includes up to date information regarding the manufacturers of all types of chemicals, heavy, fine, pure, &c., and supersedes both the old edition under the same title and the 1940 *Directory of British Fine Chemicals*. While the format of the new edition is smaller, more information is given than in the two previous Directories. The Association, whose address is 166, Piccadilly, London, W.1, will send a copy gratis to any enquirer writing on business paper or giving any other genuine indication of his being likely to put the Directory to good use as a purchaser of chemicals.

Gas Products Prices

The London Market

Dec. 27.

There are no changes to report in the prices of Coal Tar products for the home market, to-day's values being as under:—

Ball and *Flake Naphthalene*. The prices range from £26 15s. per ton in 2 cwt. single bags to £29 15s. per ton in 1 cwt. cases. These prices are for minimum 4 ton lots delivered carriage paid buyer's address.

Pitch for briquetting is 75s. per ton in bulk ex maker's works.

Road Tar is 5¼d. per gall. filled into buyer's road or rail tanks and 5¾d. per gall. filled into buyer's barrels—both at sellers' works.

Creosote for timber preservation is 5½d. per gall. ex sellers' works in bulk in minimum 800 gall. lots.

Cresylic Acid prices range from 3s. 6d. to 5s. per gall. ex makers' works according to grade.

Coal Tar Naphtha prices range from 1s. 11d. to 2s. 11d. per gall. and *Xylol* prices 3s. 3½d. to 3s. 6d. per gall., carriage paid buyer's address in bulk in 1,000 gall. lots.

The Provinces

Dec. 31.

Average prices for gas-works products: Pitch, 75s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6½d. per gall.; pure, 3s. 2½d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by Government Orders. Prices for road tar were increased by a half-penny per gall. by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

Scotland

Dec. 28.

Year closes with market unchanged.

Refined Tar.* Yield to the distiller is 5d. per gall. ex works, naked. *Creosote Oil*. Timber preserving quality* 5½d. to 6½d. per gall.; Hydrogenation Oil* 5¾d. per gall.; Low Gravity or Virgin Oil† 7½d. to 7¾d. per gall.; Benzol Absorbing Oil 6½d. to 8d. per gall. *Refined Cresylic Acid* is 3s. 6d. to 4s. 6d. per gall. ex works, naked, according to quality. *Crude Naphtha*† 7d. to 8d. per gall. *Solvent Naphtha*.* Basic maximum prices delivered in bulk 90/160 grade, 2s. 10d. per gall, and 90/190 Heavy Naphtha, Unrectified, 2s. 0½d. per gall.; Rectified, 2s. 4d. per gall. *Pyridine*† 90/160 grade, 15s. per gall., and 90/140 grade, 17s. per gall.

* Price controlled. † Controlled.

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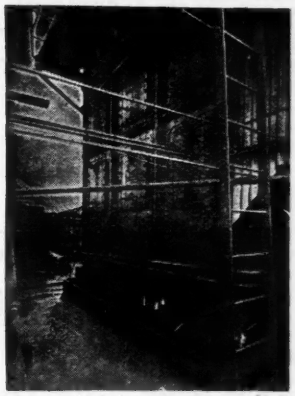

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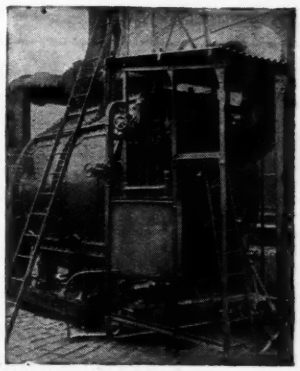

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